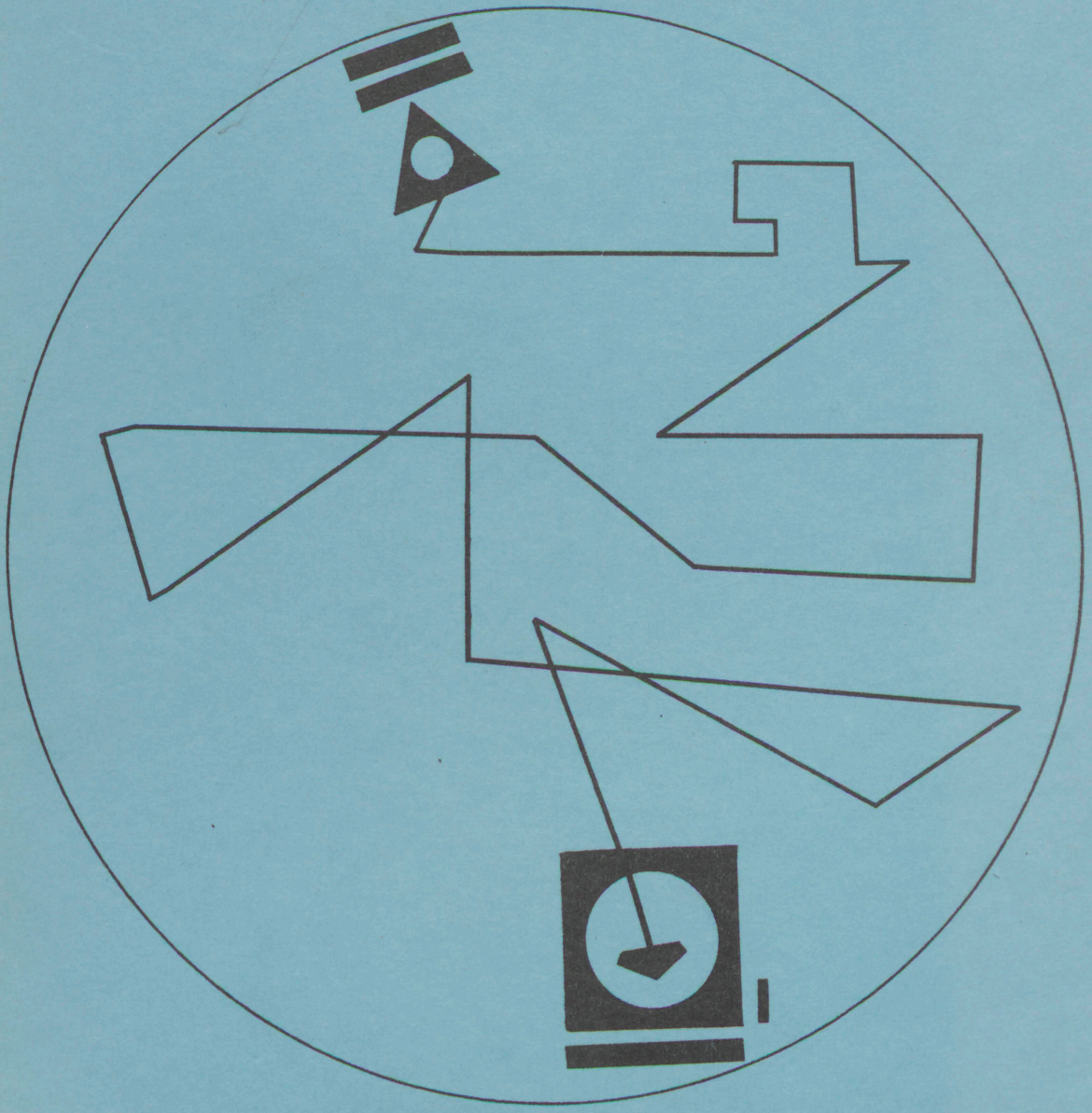
A TRANSPORTATION PLAN FOR DERRY N.H.



d by the
n New Hampshire Planning Commission 1985

A TRANSPORTATION PLAN

FOR DERRY, N.H.

JUNE 1985

Prepared by

SOUTHERN NEW HAMPSHIRE PLANNING COMMISSION

In Consultation with

COSTELLO, LOMASNEY & deNAPOLI, INC.

The preparation of this document has been financed through a grant from the New Hampshire Department of Public Works and Highways in cooperation with the U. S. Department of Transportation, Federal Highway Administration. The contents of this document reflect views of the authors and do not necessarily reflect official views or policies of the funding agencies. This document does not constitute a standard, specification or regulation.

SOUTHERN NEW HAMPSHIRE PLANNING COMMISSION

BOARD OF COMMISSIONERS

City of Manchester
- Raymond Closson
- Edward Mason
- Roland Carignan
- Armand Gaudreault

Town of Auburn
- Eugene Thomas
- Brenda Beer
- Ronald Marzloff (alt.)

Town of Bedford
- Eugene M. VanLoan, Jr.
- Alfred Lambert
- Elizabeth Corell (alt.)

Town of Candia
- Roland Girard
- Mabel Brock

Town of Chester
- Charles Ryan
- Percival M. Lowell

Town of Deerfield
- James Alexander
- Joseph Dubiansky

Town of Goffstown
- Arthur W. Rose, Chairman
- Milton Meyers
- Robert Wheeler

Town of Hooksett
- Ray F. Langer
- Sidney Baines
- Richard Marshall (alt.)

Town of Londonderry
- Donald M. Babin
- Gordon Arnold
- Harry W. Anagnos

Town of New Boston
- August Gomes
- Nonah Poole

Town of Raymond
- Stephen Sloan
- Ronald P. Simone

Town of Derry
- Janet Conroy
- Deborah Nutter
- Robert Cole

STAFF

Executive Director	Manindra N. Sharma
Chief Planner	James W. Tethers
Planner II	George Jepson
Planner II	Thomas Martin
Planning Technician	Mark Sargent
Graphic Artist	Lisa Caron
Secretary	Muriel Batchelder

Cutler L. Brown, Planner III, who resigned as of January 3, 1986, was the principal staff person assigned to this study.

Southern New Hampshire
Planning Commission
815 Elm Street/Manchester, N.H. 03101
603·669·4664

January 24, 1986

Mr. Wallace Stickney, Commissioner
New Hampshire Department of Public
Works and Highways
John O. Morton Building
Concord, NH 03301

Attention: Mr. Robert G. Keneval
Planning and Economics Engineer

Dear Mr. Stickney:

We are pleased to transmit our final report on the Transportation Plan for the town of Derry, New Hampshire.

Initiated about one-and-a-half years ago at the request of the former Commissioner, John Clements, and the town officials of Derry, this planning study was part of the Unified Work Program FY'85. The draft report was completed in June 1985, and was forwarded to the town officials of Chester, Londonderry and Derry for their comments. As of this date, no communication has been received from either Chester or Londonderry.

The plan attempts to identify all short- and long-range improvements that are necessary to mitigate the operational and safety problems on Route 102 in Derry. Although Alternate #2, dealing with the creation of a local bypass, was recommended strictly on the basis of the construction cost, it is becoming increasingly clear that the cost of land acquisition on Route 102 near Londonderry Road will be prohibitive and likely to create severe economic hardship for the businesses in that area.

Therefore, it is our considered opinion that Alternate #3, which includes a ramp near the Ash Street area in addition to all other improvements as recommended in Alternate #2, is more appropriate. The town of Derry supports Alternate #3, and has notified us accordingly.

Our thanks to Messrs. Earle Chesley and Glenn Chouinard, consulting engineers of Costello, Lomasney & deNapoli, Inc., who provided assistance in analyzing the alternatives and developing recommendations.

We appreciate the opportunity to undertake this study. The cooperation of your departmental staff, especially Richard Marshall and Robert Lyford, is deeply appreciated.

Very truly yours,

SOUTHERN NEW HAMPSHIRE
PLANNING COMMISSION

M. N. Sharma
Executive Director

EXECUTIVE SUMMARY

A comprehensive study of the highway and street system serving Derry was undertaken in order to determine the existing and future capacities of the roadway system and to identify where deficiencies exist or are expected to develop. Projections of social and economic data affecting trip making were developed for the year 2005 in order to generate the estimated future volumes expected on the highway network. These were then compared to the existing or expected capability (capacity) of the highway network, including intersections. Deficiencies identified in this manner represent the long range needs of the community, and project construction will provide safe and efficient operating conditions in the future.

The short range projects were identified through the investigation of accident statistics, field observation, and identification of controlling intersections as the study progressed.

Total improvement program construction costs are estimated to be $10,904,000.00 at 1985 levels. A list of the projects in the form of a recommended improvement program follows:

Recommended Improvement Program[1]

	Project	Cost
Short Range		
A.	NH 28/NH 102 Intersection	$ 50,000
B.	Tsienneto Road/NH 28 Bypass Intersection	200,000
C.	Maple Street/Broadway Intersection	10,000
D.	Kendall Pond Road/Fordway Intersection	10,000
E.	NH 28/Windham Road Intersection	35,000
F.	Fordway/NH 102 Intersection	1,000
	SUBTOTAL	$306,000
Long Range		
A.	Broadway	$ 1,350,000
B.	NH 28/NH 102 Intersection	1,050,000
C.	Londonderry Road including NH 102 Intersection	1,887,000
D.	Crystal Ave/Tsienneto Rd/Folsom Rd Intersection	875,000
E.	Maple Street	1,000
F.	Bypass	3,500,000
G.	NH 28/Windham Road Intersection	135,000
H.	NH 102/NH 28 Bypass Intersection	1,400,000
I.	NH 28/NH 28 Bypass Intersection	400,000
	SUBTOTAL	$10,598,000
	TOTAL	$10,904,000

1 Costs are given in 1985 dollars, and exclude any right-of-way acquisition.

TRANSPORTATION STUDY FOR THE TOWN OF DERRY

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Preface

The town of Derry has experienced significant changes in land use during the past two decades. The most pronounced impact of such growth is being felt on N.H. Route 102. High traffic volume, proliferation of curb cuts and lack of capacity of the roadway - all of these in combination have created operational and safety problems for the motorist, and have begun to threaten the vitality of the central business district of Derry. At the present time, there is no long-range transportation plan for the town of Derry. Without such a plan, the town is hard put to make growth-related decisions that affect the road and highway system of the town.

The purpose of this study is to develop a highway plan for the year 2005 which facilitates the movement of goods and people. Analyses of roadway capacities and vehicle activity at intersections provided the basis for recommendations regarding both long and short range improvements.

Chapters I and II discuss the highway system as it currently exists. Chapters III and IV present the current and future socioeconomic conditions in the Town of Derry. Chapter V describes the process of converting the socioeconomic data into roadway volumes. Chapter VI deals with the development of alternative networks and the effect on traffic assignments and problem intersections. Chapter VII capsulizes the recommended program, giving project descriptions and estimated costs.

Recommendations resulting from this analysis address both long and short range capital highway improvement projects.

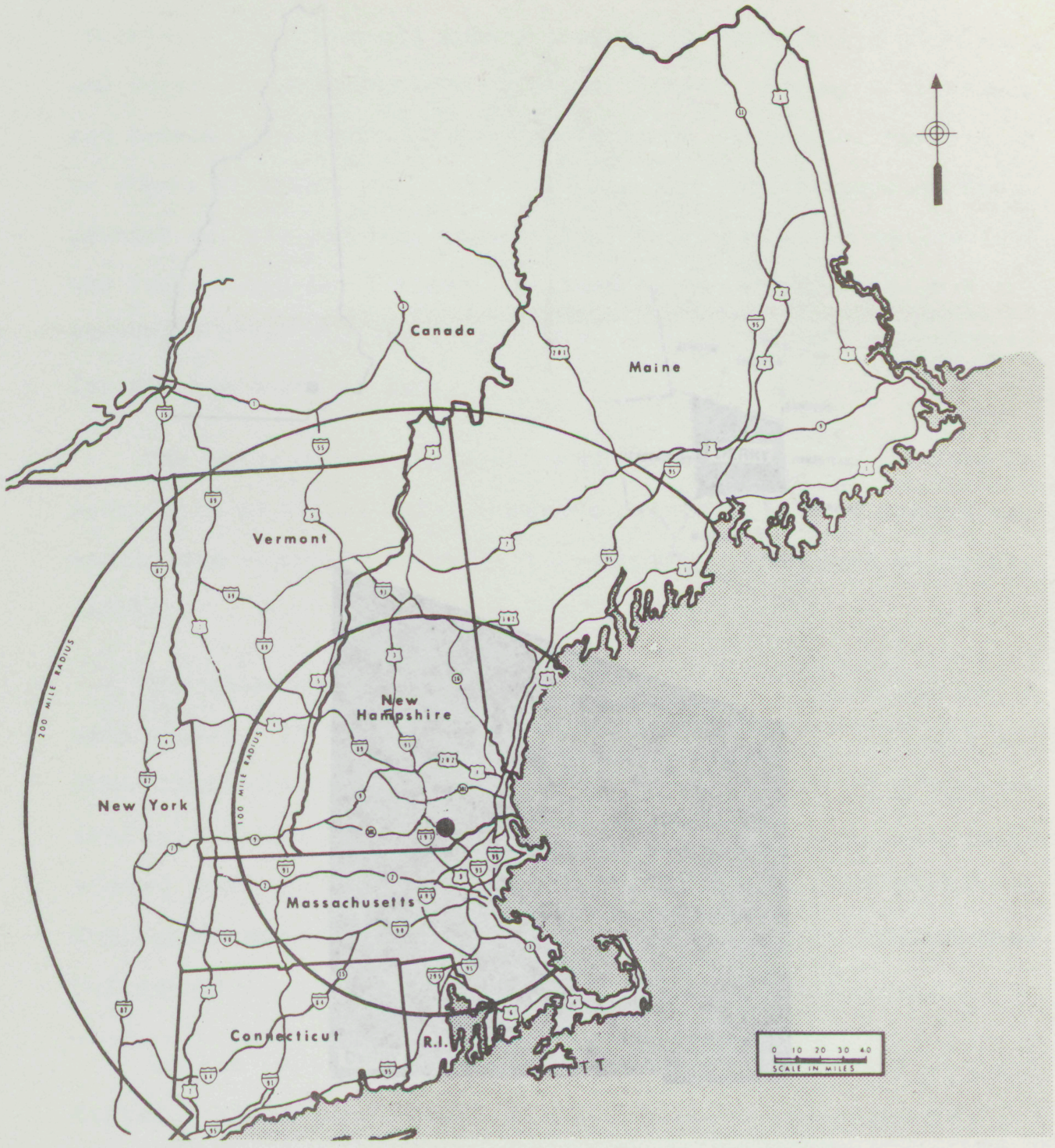
CHAPTER I. INTRODUCTION

Study Area

The town of Derry lies in the southeast quadrant of the State, is part of Rockingham County, and consists of 22,784 acres (35.6 sq. miles). It is bounded on the north by Auburn and Chester, on the east by Hampstead, on the south by Windham and Salem, and on the west by Londonderry. Derry is 13 miles from Manchester, 26 miles from Concord, 12 miles from Nashua, and 46 miles from Portsmouth. In the more regional setting, it is approximately 54 miles north of Boston, 130 miles from Hartford, Connecticut, 250 miles from New York City, and 260 miles from Montreal, Canada. The estimated 1983 population was 22,471. Figures 1 & 2 indicates the location of the town relative to New England and New Hampshire.

Area Amenities

Access to recreational facilities and educational opportunities, climate, location, and tax structure make the area attractive to residential location and business enterprises. The town is a one-hour drive from the New Hampshire seacoast, and easy access to I-93 enables residents to afford themselves the opportunity of going to resort areas in the White Mountains and Lakes Region. Both these areas offer year-round recreational activities such as skiing, swimming, hiking, boating, camping and pleasure rides. Pawtuckaway State Park (Nottingham) and Bear Brook State Park (Allenstown) are approximately a 40-minute drive from Derry. Within the town itself, the school facilities at

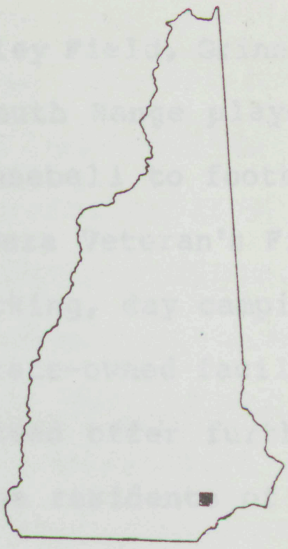


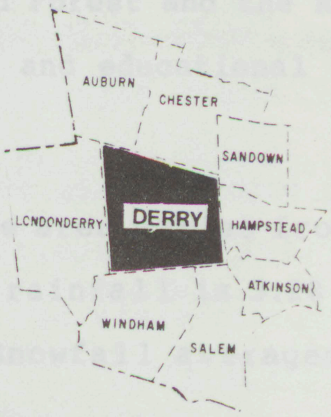
REGIONAL SETTING

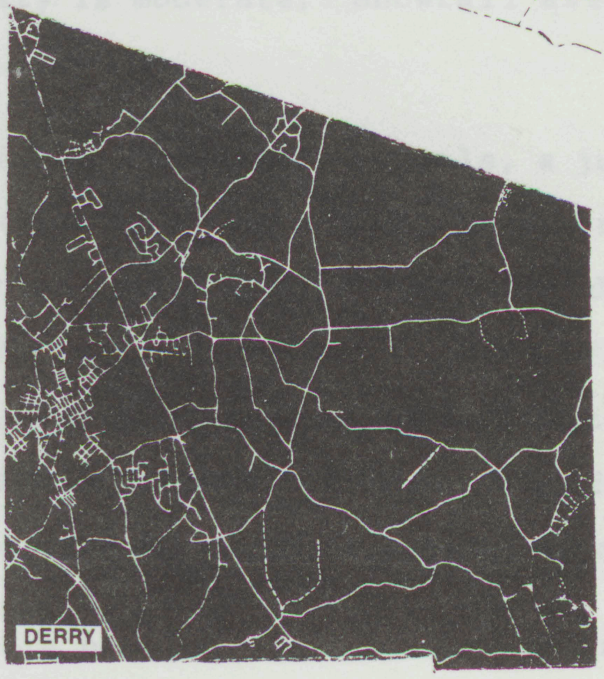
LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.







LOCAL SETTING

LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

Buckley Field, Grinnell School playground, Smith Field playground and South Range playground offer activities ranging from tennis and baseball to football and field sports. Municipal facilities at O'Hara Veteran's Field and the Alexander Carr Playground offer picnicking, day camping, snowshoeing, and field sport activities. The state-owned facilities of Ballard Forest and the Robert Frost Homestead offer further recreational and educational experiences for the residents of Derry.

The average temperature for the area varies from 21.1°F in January to 69.6°F in July. Average rainfall is 3.28 inches per month, and humidity is moderate. Snowfall averages 60 inches yearly.

The town has four elementary schools, a junior high and a high school. In terms of higher education, several colleges and other institutions of higher learning are located nearby, specifically New Hampshire College, Notre Dame College, Merrimack Valley College, Hesser College and N.H. Vocational Technical College in Manchester; Magdalen College in Bedford; White Pines College in Chester; and St. Anselm's College in Goffstown.

Health care is provided in town at the Parkland Medical Center. Three other hospitals are located in Manchester and provide medical services to the town: Catholic Medical Center, U.S. Veteran's Administration Hospital and the Elliot Hospital, all in Manchester. Other hospitals near Derry are located in Exeter, Concord and Nashua.

The town has a small central business district (CBD) as well as the Hood Shopping Center. These serve the needs of Derry residents as well as residents from the surrounding towns. Other shopping centers readily accessible to Derry residents include Derry Plaza Shopping (Route 102 Londonderry); the Mall of New Hampshire (I-293 at South Willow Street, Manchester); and the Bedford Mall/Jordan Marsh Plaza (I-293 & U.S. 3, Bedford).

Housing opportunities are afforded in a mix of single family houses, duplexes and apartments in urban, suburban and rural settings. Approximately 54% of the housing is newer, having been constructed since 1970.

Transportation

The town of Derry is served by highway and air facilities. The highway system accommodates the majority of passenger and freight movements, while air transportation provides service to business executives and for high value goods delivery via nearby Manchester Airport.

Major highways in Derry are N.H. Routes 102, N.H. 28 and N.H. 28 Bypass. The former provides for east-west travel and connects the town with Chester in the east and Londonderry in the west. The latter two provide for north-south travel, connecting the town with Manchester and Auburn on the north, and Salem to the south. Interstate 93 lies in the southwest quadrant of town, and via the ramps in Londonderry on N.H. 102, provides access to Boston and points in northern New Hampshire.

Passenger service is provided by automobile, taxi, airplane and bus. Town Taxi, based in Derry, provides pick-ups in Derry, as well as Londonderry, Chester and Auburn; drop-offs are made anywhere within a 55 mile radius. Limousine service is provided by Hudson Bus Lines between Logan Airport in Boston and Manchester, with stops in Salem and Nashua, N.H. Interstate bus service is provided by Concord Trailways and Vermont Transit between Manchester and major New England cities. These buses make intermediate stops in Nashua. People's busline also provides limited in-state service between Brattleboro, Vermont and Keene, New Hampshire via Manchester. The Manchester Airport provides commercial passenger service utilizing United, Bar Harbor, Pilgrim and Precision Airlines. These carriers provide daily service to New York City, Chicago, Boston, Hartford, Providence and several locations in Maine.

Authority For Study

The 1962 Federal Aid Highway Act required that local, state, and federal governments cooperate when developing a highway plan and consider the plan's effect on the future development of an area; this was the basis for long range highway planning as it currently exists.

Although not part of the Manchester study area, which has had an ongoing planning process for years, Derry town officials realize the need for a plan. Discussions between town officials and the NHDPW&H Commissioner regarding the possibility of constructing a northerly bypass relieving Broadway, and a ramp off

I-93 to an industrially zoned area, prompted this study. It is intended to document the town-wide needs of the total highway system.

The Southern New Hampshire Planning Commission, working with the NHDPW&H staff, was designated to conduct the study under the local assistance part of its Unified Work Program for FY 1985. Costello, Lomasney and deNapoli, Inc., a Manchester-based consulting firm, provided technical support.

Scope of Study

The objective of this study is to develop a prioritized program of highway improvement projects that address current and future needs. Traditionally, a short range planning document is prepared for projects that are easy to implement and are not capital intensive, while a long range plan includes projects that are identified on the basis of deficiencies in a future year, are not readily implemented, and are capital intensive. This study combines both short and long range projects, and identifies needs on a system wide and intersection basis. In order to accomplish the overall objective, the following tasks were undertaken:

- Define traffic zones and develop a transportation network upon which to perform capacity analysis;
- Develop traffic volume projections utilizing current and projected socioeconomic data and traffic counts;

- Conduct surveys of parking supply, roadway geometrics, traffic control devices, turning movements, and accident history;

- Perform capacity analysis, identify deficiencies, and develop recommendations based on priority;

- Develop construction costs for the recommended program.

Other activities included coordinating with the Derry Planning Board, town employees, consultants involved in other planning activities, and personnel from the NHDPW&H. A series of meetings with the Derry Planning Board were conducted in order to keep them appraised of progress and to gain necessary input as the study progressed.

CHAPTER II. EXISTING STREET AND HIGHWAY NETWORK

HIGHWAY SYSTEM

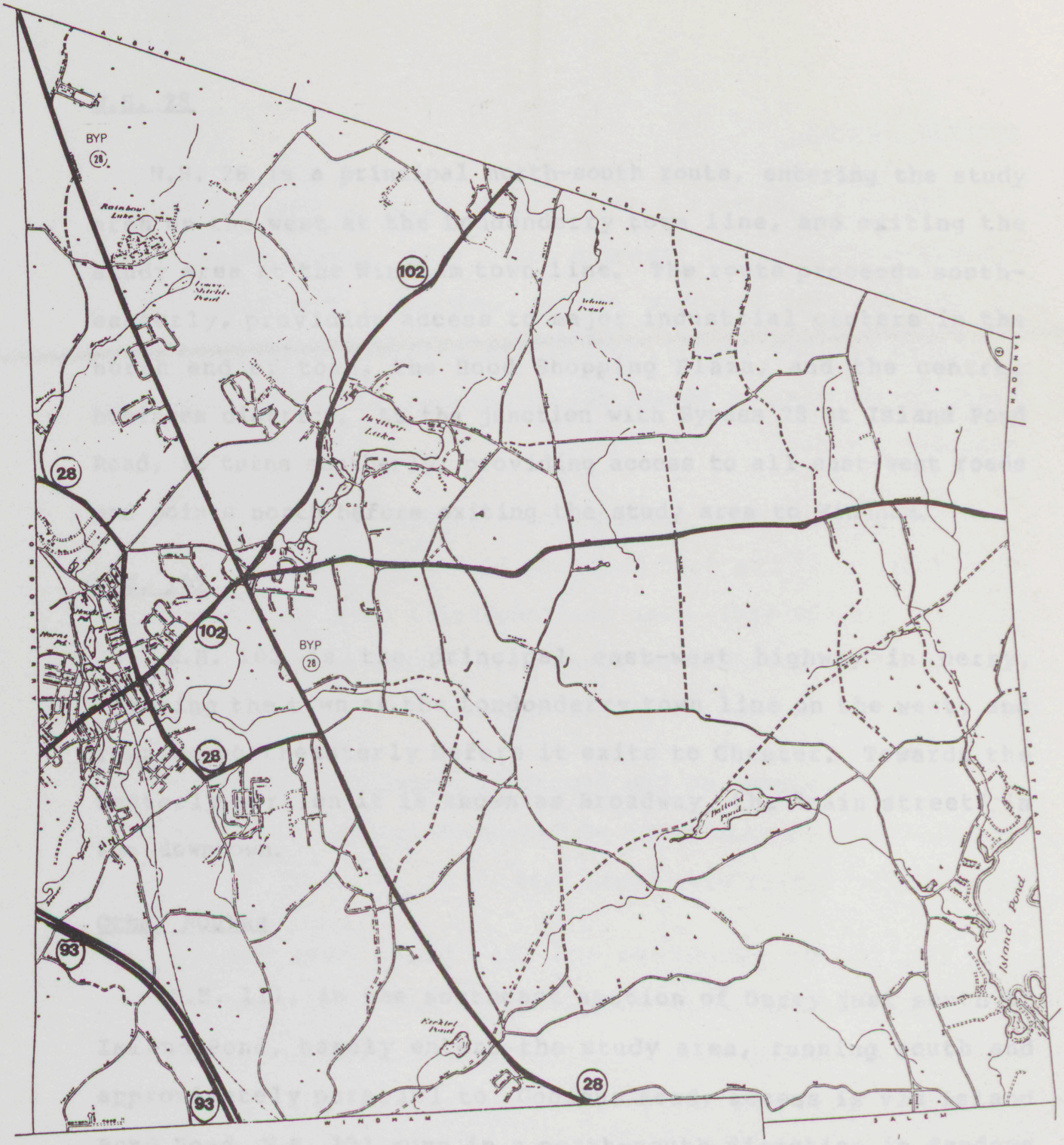
The major street and highway network serving the Derry area is illustrated in Figure 3. Important highways in the study area include the following routes:

Interstate 93

I-93 begins in Boston, passing through the study area, and proceeds northerly to the White Mountain National Forest. A portion of this four-lane, controlled-access highway passes through the southwest corner of Derry, heading in a northwesterly direction. Access to I-93 for Derry residents is provided at the interchange with N.H. 102 in Londonderry. As of this writing, there is no access to I-93 in Derry, although there are underpasses at Fordway Avenue Extension and Kendall Pond Road.

N.H. 28 Bypass

Bypass 28 is a principal north-south route through the study area, entering from Auburn in the north and terminating at its junction with N.H. 28. This road provides access to all east-west roads in town prior to its junction with N.H. 28 at Island Pond Road, and runs parallel to and east of I-93.



MAJOR STREET AND HIGHWAY NETWORK

LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

Scale: Miles 1 0 1 2000 4000 Feet

N.H. 28

N.H. 28 is a principal north-south route, entering the study area on the west at the Londonderry town line, and exiting the study area at the Windham town line. The route proceeds southeasterly, providing access to major industrial centers in the north end of town, the Hood Shopping Plaza, and the central business district. At the junction with Bypass 28 at Island Pond Road, it turns southerly, providing access to all east-west roads and points north before exiting the study area to Windham.

N.H. 102

N.H. 102 is the principal east-west highway in Derry, entering the town at the Londonderry town line on the west, and running northeasterly before it exits to Chester. Towards the westerly portion it is known as Broadway, the "main street" in the downtown.

Other Routes

N.H. 111, in the southeast section of Derry just south of Island Pond, barely enters the study area, running south and approximately parallel to Goodhue Road; access is via Island Pond Road. N.H. 121 runs in a north-south direction in Sandown and Hampstead, just entering the study area at the extreme northeast corner of town. Access to this route is via Hampstead Road.

TRAFFIC VOLUMES

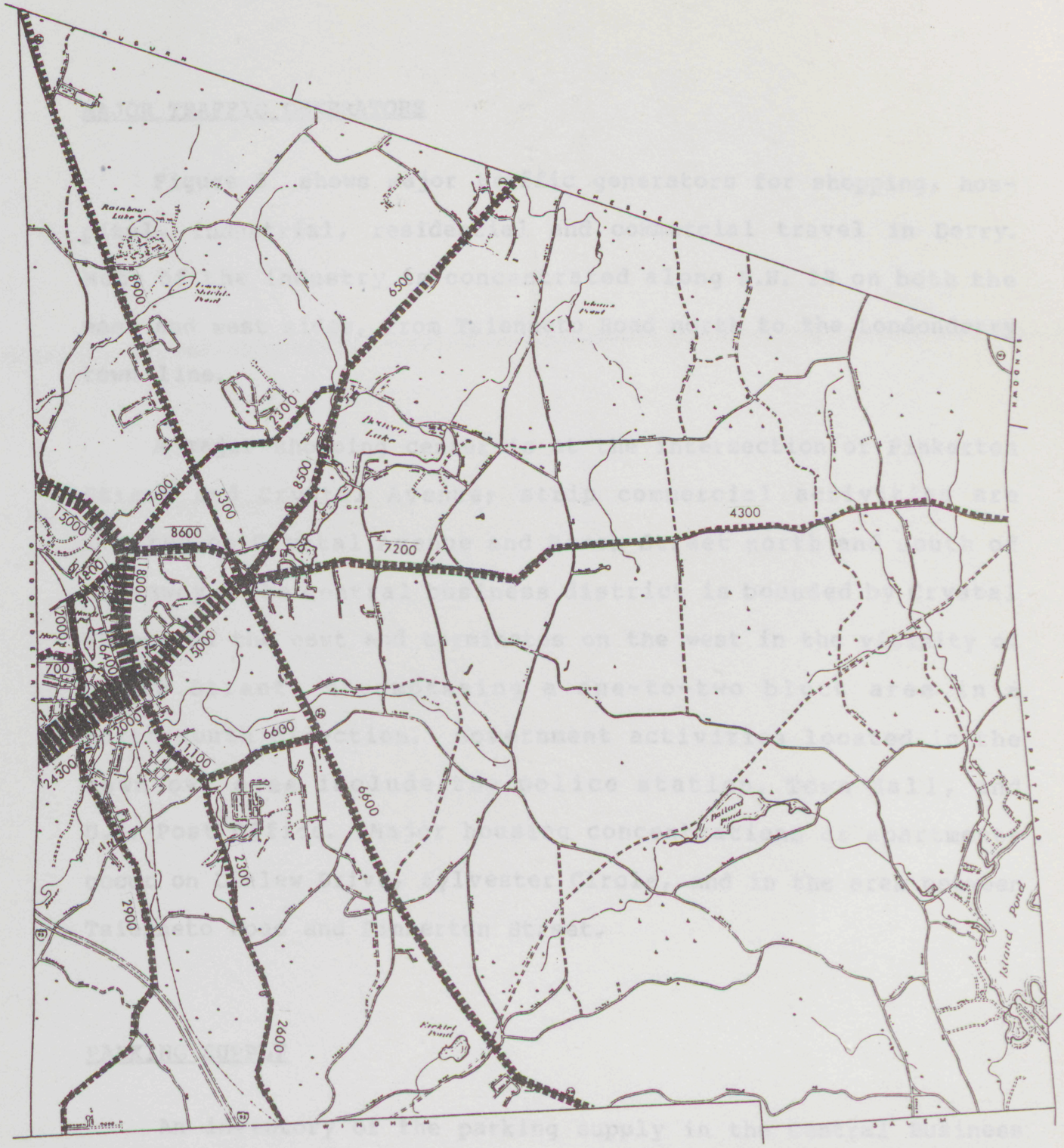
Figure 4 shows the 1984 traffic flows as derived from the NHDPW&H traffic counts taken in Derry. The highest volumes occur on N.H. 102 (West Broadway) at the Londonderry Town Line (24,300 vehicles per day [vpd]), and at the railroad crossing (22,000 vpd); to the east of Bypass 28, volumes on N.H. 102 drop to 8,500 vehicles per day.

The next highest volumes occur on N.H. 28 (Crystal Ave.) in the vicinity of the Hood Shopping Plaza (18,000 vpd), north of Broadway (16,400 vpd), near the Industrial Park (15,000 vpd) and just south of Broadway on Birch Street (11,100 vpd). South of Birch Street, volumes on N.H. 28 drop to 6,600 vehicles per day.

Traffic volumes on N.H. Bypass 28 ranged from a low of 3,300 vehicles per day just south of Tsienneto Road to a high of 8,900 vehicles per day at Olde Coach Road.

Traffic on Hampstead and East Derry Road ranged from 4,300 vpd (east of Adams Pond Road) to 7,200 vpd near Cemetery Road. On Tsienneto Road, near Beaver Lake, traffic volumes were 2,300 vpd, building to 7,600 vpd approaching N.H. 28. Folsom Road, just west of N.H. 28, and directly opposite Tsienneto Road carried 4,800 vehicles per day.

The remaining streets varied from 700 vpd on Ash Street to 2,900 vpd on Fordway Street.



TRAFFIC VOLUMES- 1984

LEGEND

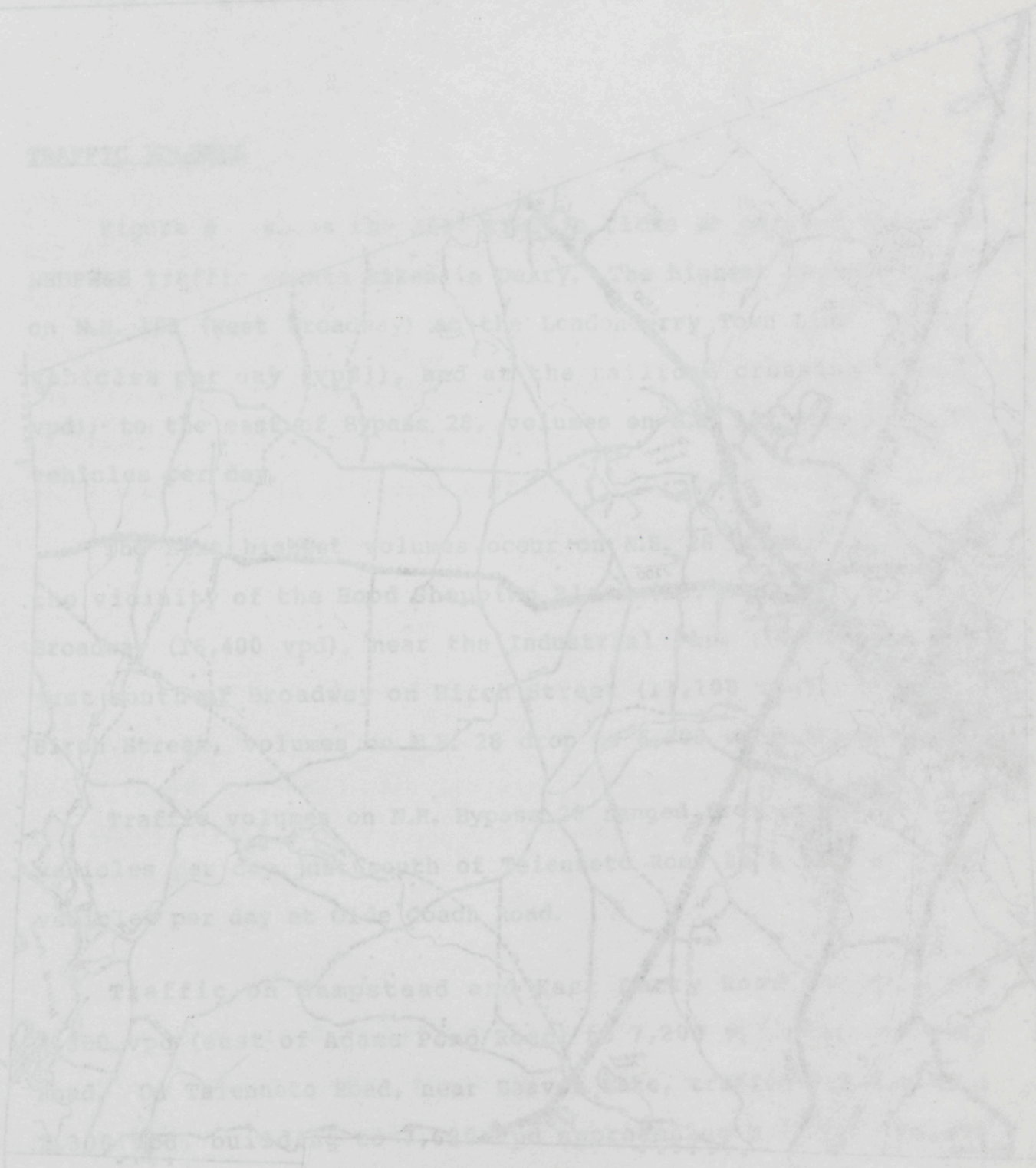
30,000 20,000 15,000 10,000 3000

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

Scale: Miles 1 1/2 1 2000 4000 Feet



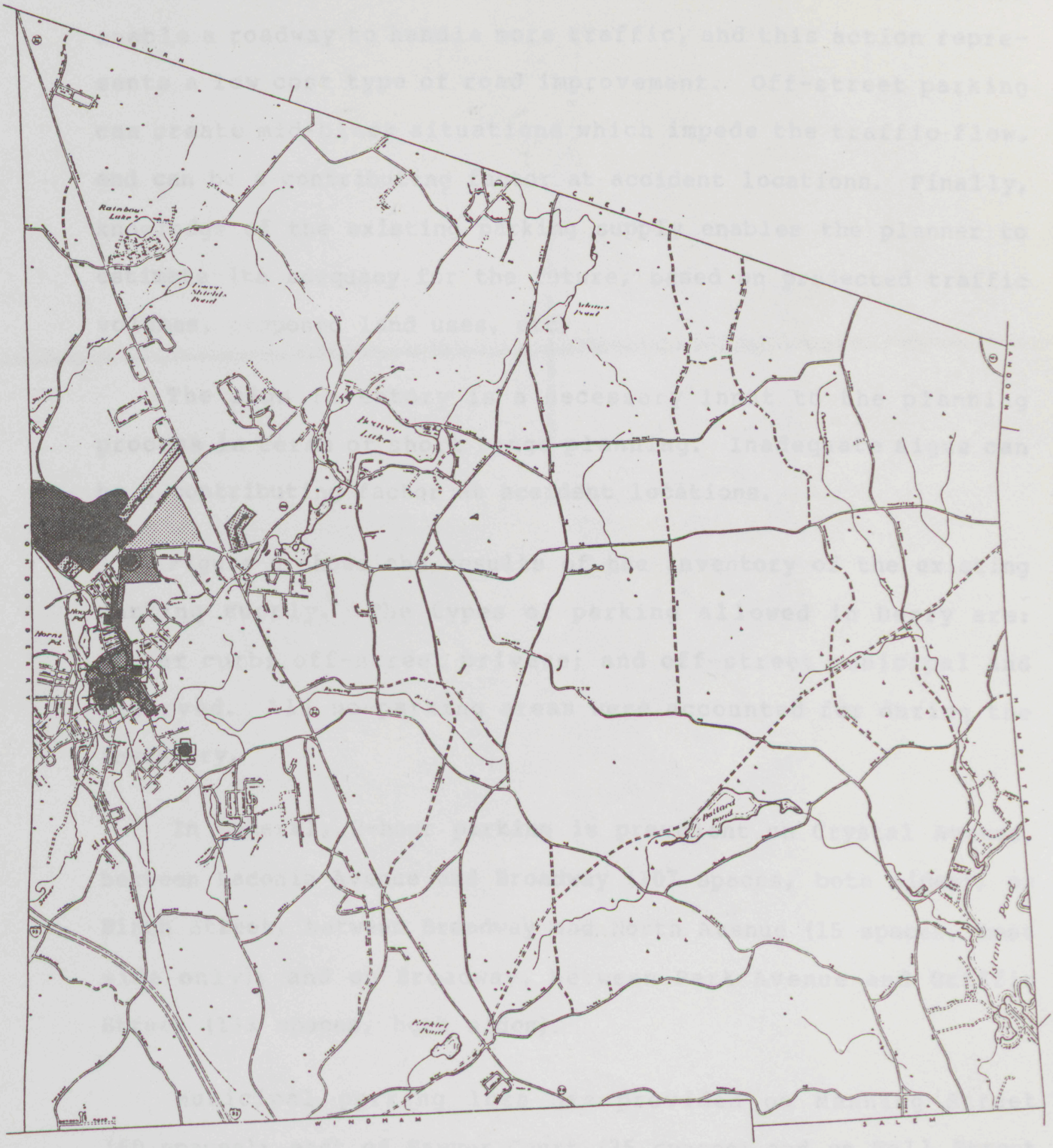
MAJOR TRAFFIC GENERATORS

Figure 5 shows major traffic generators for shopping, hospital, industrial, residential and commercial travel in Derry. Most of the industry is concentrated along N.H. 28 on both the east and west sides, from Tsienneto Road north to the Londonderry town line.

A major shopping center is at the intersection of Pinkerton Street and Crystal Avenue; strip commercial activities are located on Crystal Avenue and Birch Street north and south of Broadway. The central business district is bounded by Crystal Avenue on the east and terminates on the west in the vicinity of Maple Street, encompassing a one-to-two block area in a north/south direction. Government activities located in the downtown area include the police station, Town Hall, and U.S. Post Office. Major housing concentrations of apartments occur on Linlew Drive, Sylvester Circle, and in the area between Tsienneto Road and Pinkerton Street.

PARKING SUPPLY

An inventory of the parking supply in the Central Business District was conducted. On-street as well as off-street spaces were tabulated. Simultaneously, a sign inventory was conducted in the same geographic area. Knowledge of the existing supply is helpful in the transportation planning process for a number of reasons. On-street parking affects roadway capacity, or the



MAJOR TRAFFIC GENERATORS

LEGEND

SHOPPING
- Regional
- Local

HOPITAL

COMMERCIAL

INDUSTRIAL
- Parks
- Areas

GOVERNMENT

MULTI-FAMILY HOUSING

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

Scale: Miles 1 1/2 1 2000 4000 Feet

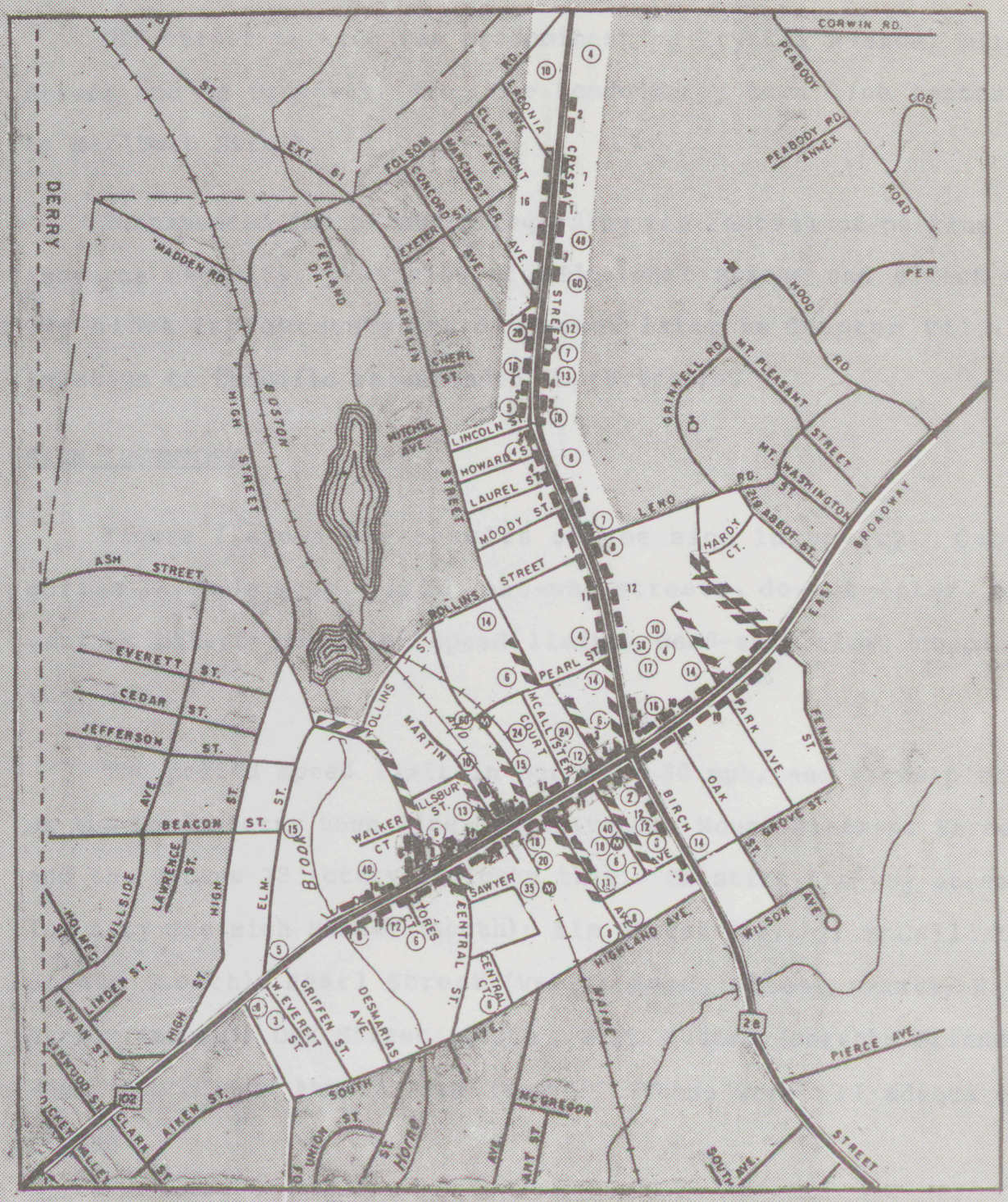
ability of a road to handle traffic. Often, its removal can enable a roadway to handle more traffic, and this action represents a low cost type of road improvement. Off-street parking can create mid-block situations which impede the traffic flow, and can be a contributing factor at accident locations. Finally, knowledge of the existing parking supply enables the planner to estimate its adequacy for the future, based on projected traffic volumes, proposed land uses, etc.

The sign inventory is a necessary input to the planning process in terms of short range planning. Inadequate signs can be a contributing factor at accident locations.

Figure 6 shows the results of the inventory of the existing parking supply. The types of parking allowed in Derry are: 2 hour curb; off-street private; and off-street municipal and reserved. All no-parking areas were accounted for during the inventory.

In general, 2-hour parking is prevalent on Crystal Avenue, between Laconia Avenue and Broadway (107 spaces, both sides); on Birch Street, between Broadway and North Avenue (15 spaces, west side only); and on Broadway, between Park Avenue and Griffin Street (133 spaces, both sides).

Municipal parking lots are provided on Manning Street (60 spaces); east of Sawyer Court (35 spaces) and on Wall Street (40 spaces).



CBD PARKING SUPPLY

LEGEND

- NO PARKING
- 2HR CURB PARKING
- (00) OFF STREET
- (M) Municipal
- (R) Reserved

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

0.1 0 0.1 0.2 MILES 1985
1" = 600'

Off-street parking was predominant on Crystal Avenue, Birch Street and on Broadway, from the Londonderry town line easterly to Marlboro Street.

Recommended improvements regarding the removal of parking to increase capacity, provision of additional spaces and effect on mid-block improvements are discussed later in Chapter VII, in relation to specific recommended improvements.

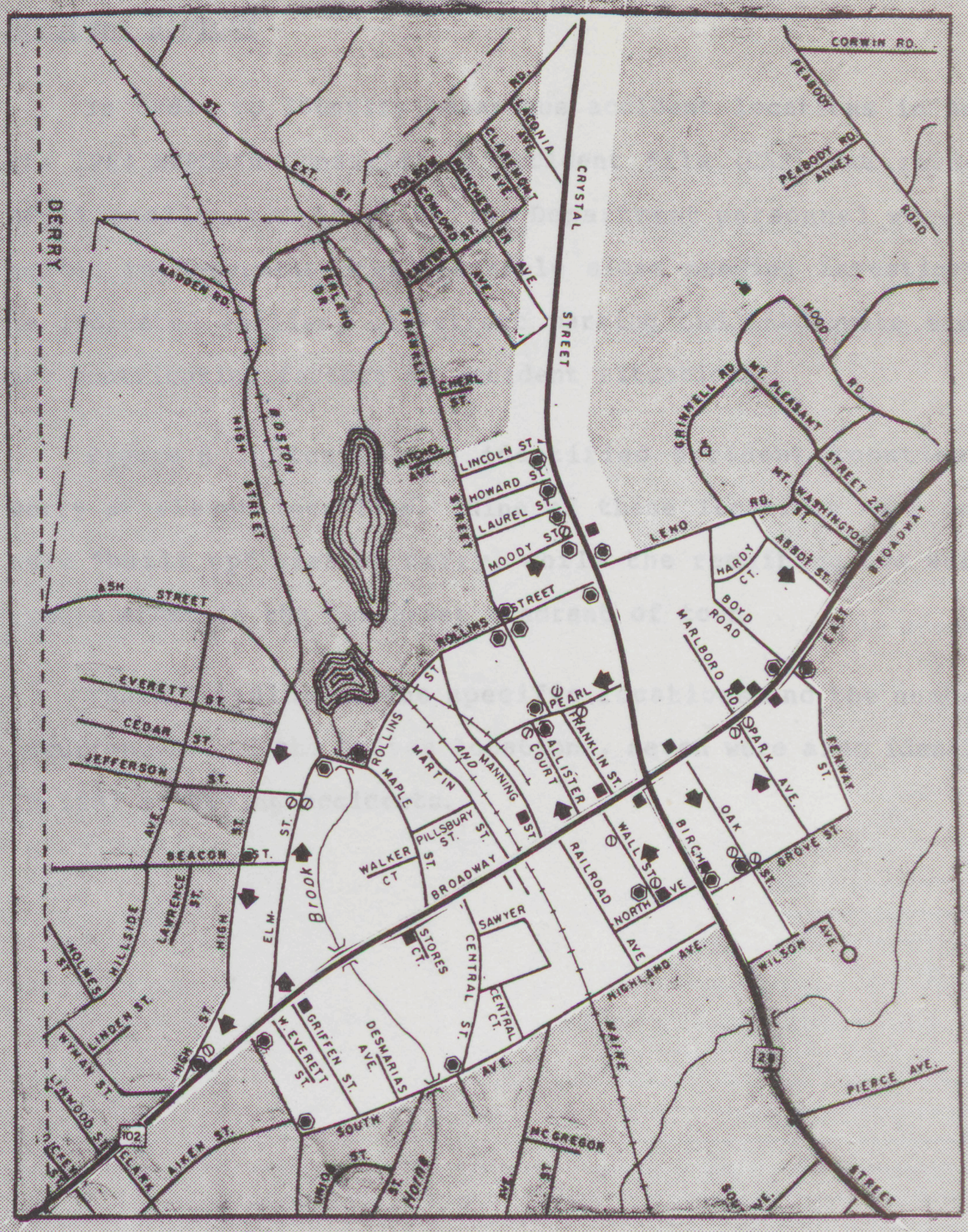
SIGN INVENTORY

Figure 7 shows the results of the sign inventory. Categories include stop, yield, one-way streets, do-not-enter, and various others including speed limits, dead-end, slow, no-parking, etc.

The posted speed limit in Derry is 30 mph, and signs placed at the Londonderry town line, Park Avenue, Mount Pleasant Street, and the Bypass 28 rotary indicate this. Existing one-way streets in Derry are High Street (south); Elm Street (north); McCallister Street (north); Pearl Street (west); Moody Street (east); Wall Street (south); Oak Street (south); Park Avenue (north); Grinnell Road (south) and Abbott Road (south). These were all adequately signed.

Recommended improvements (as necessary) regarding upgrading of signs, proposed one-way streets, speed limits, etc., are discussed later in Chapter VII in relation to specific recommended highway improvements.

FIGURE 7



CBD SIGN INVENTORY

LEGEND

- STOP SIGN
- YIELD
- ONE WAY
- DO NOT ENTER
- MISC. REGULATORY SIGNS

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

0.1 0 0.1 0.2 MILES 1985
1" = 600'

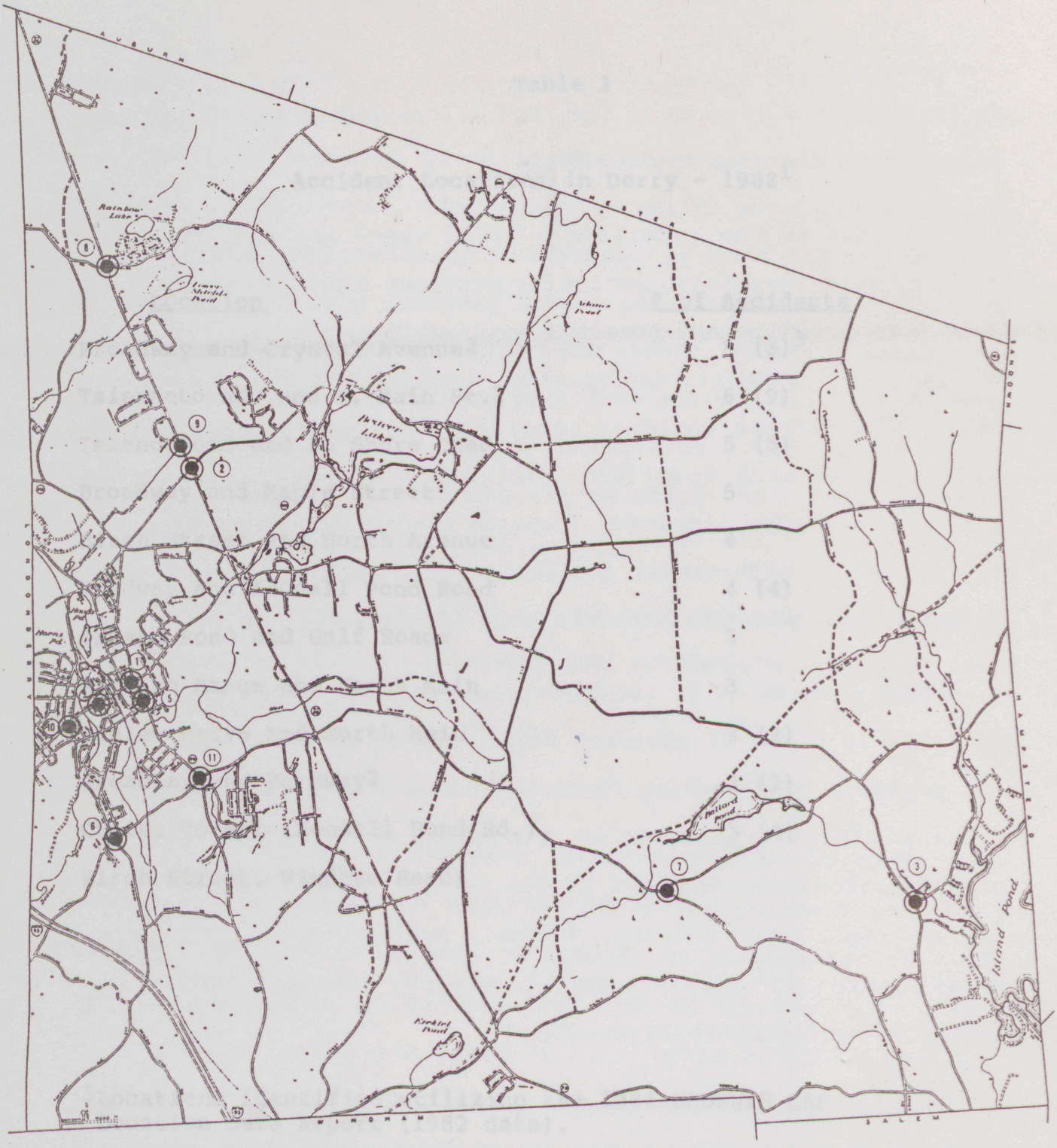
ACCIDENT HISTORY

In order to identify hazardous accident locations in Derry, the 1984 NHPDW&H Consolidated Accident File (CAF) was reviewed. Additionally, the Derry Police Department personnel were consulted to determine other possible sites needing investigation. As indicated earlier, off-street parking and inadequate signing are contributing factors to accident situations.

Figure 8 indicates the identified accident locations in Derry at eleven locations. Nine of these locations were in the more "built up" area of Derry, while the remaining two were in remote areas in the southeast quadrant of town.

Table 1 indicates the specific locations and the number of occurrences. Of the eleven locations, seven were also identified in 1983 as having accidents.

FIGURE 8



ACCIDENT LOCATIONS

LEGEND

		Number of Accidents
(1)	Broadway-Crystal Ave.	8
(2)	Tsienneto Rd.-N. Main St.	6
(3)	Is. Pond- N. Shore Rd.	5
(4)	Broadway-Maple St.	5
(5)	Birch St.- North Ave.	4
(6)	Fordway-Kendall Pond Rd.	4
(7)	Island Pond- Gulf Rd.	3
(8)	English Range Rd.-N. Main St.	3
(9)	Linlew Dr.- N. Main St.	3
(10)	Broadway- Fordway	3
(11)	N.H. 28 -Windham Rd.	3

◉ Accident Location

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

Scale: Miles 1 1/2 1 2000 4000 Feet

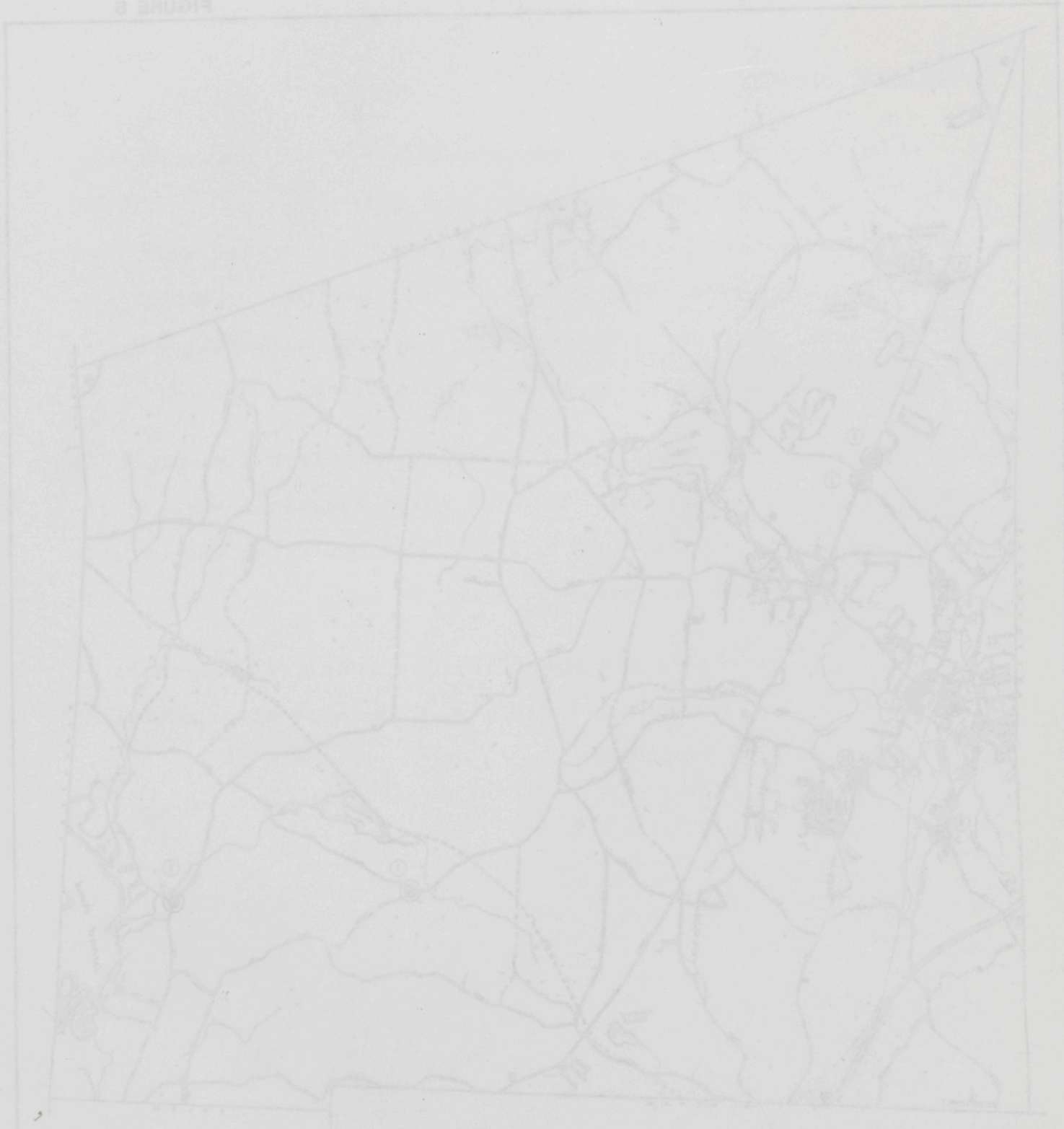


Table 1

Accident Locations in Derry - 1982[1]

Location	# of Accidents
Broadway and Crystal Avenue[2]	8 (3)[3]
Tsienneto Rd. and N. Main St.[2]	6 (9)
Island Pond and N. Shore Road	5 (5)
Broadway and Maple Street	5
Birch Street and North Avenue	4
Fordway and Kendall Pond Road	4 (4)
Island Pond and Gulf Roads	3
English Range and North Main	3
Linlew Drive and North Main	3 (2)
Broadway and Fordway[2]	3 (2)
Chutes Corner (Kendall Pond Rd.), Birch Street, Windham Road)	3 (4)

[1]Locations identified utilizing the 1984 NHDPW&H CAF Location Data Report (1982 data).

[2]Town has requested traffic lights at these locations.

[3]( ) indicates 1983 accidents

At three of the locations, the town had requested new or upgraded traffic signals from the NHDPW&H.

At each of the locations a field check was made to sketch all the road inventory, including pavement width, pavement markings (striping), signs, possible obstructions to view, land uses, delineation of lanes, and existing traffic control devices (if any). The NHDPW&H accident records indicated specifics of the accidents at each location, including: number of injuries, number of vehicles involved, lighting conditions, pavement conditions, on- or off-roadway accidents, intersecting streets, type of collision, pedestrian involvement and angle of collision.

Upon completion of the field observations, each location was analyzed in terms of accident significance, existing conditions, and possible contributing factors. Based on the foregoing, possible mitigative measures to reduce the number of accidents at each location were proposed in the categories of signing, removing of sight obstructions, access, provision of turn lanes, installation of traffic signals, roadway geometry and maintenance, and striping improvements.

Recommendations for improving the conditions at high accident locations are contained in Chapter VII, Recommended Highway Improvements.

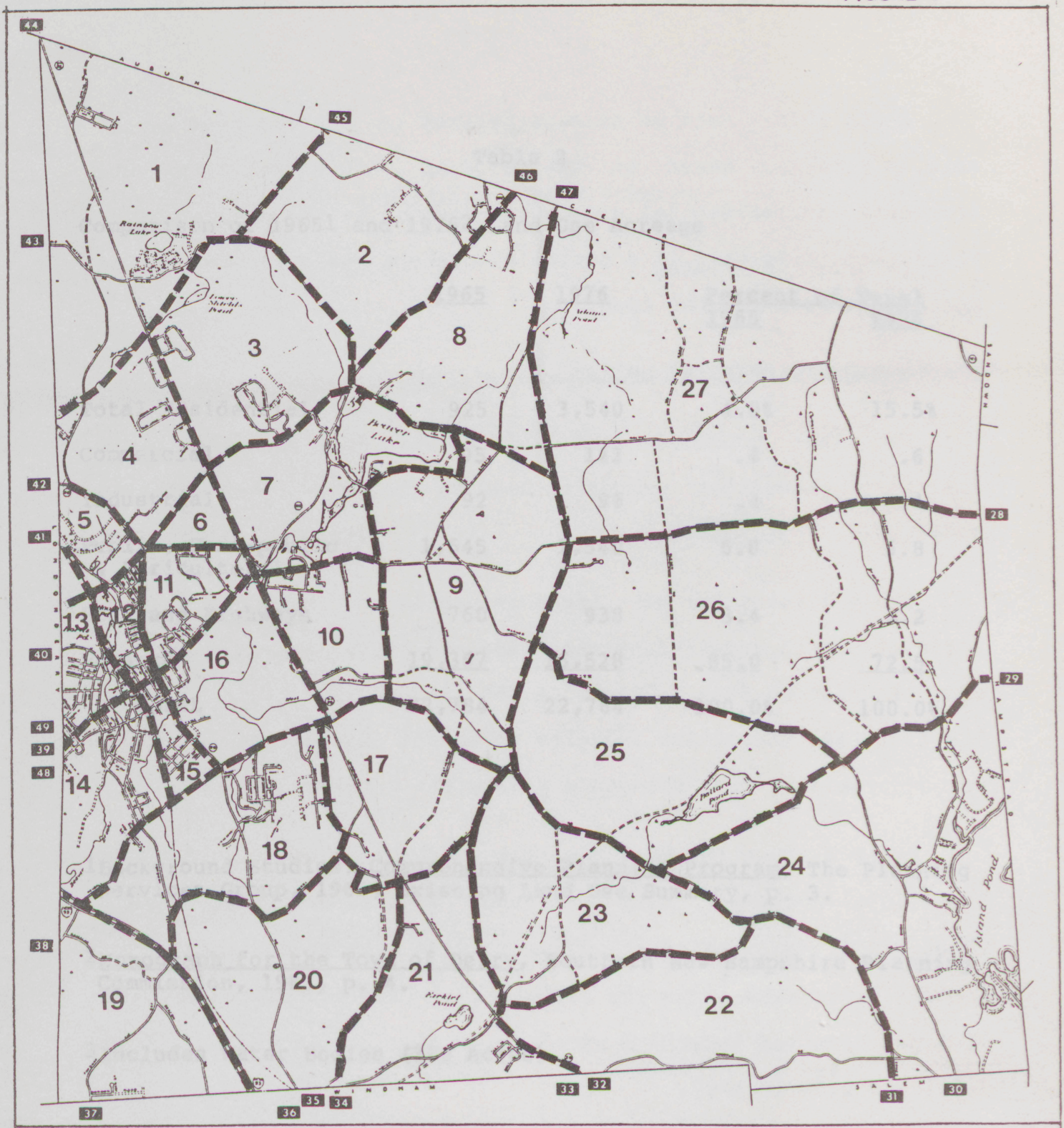
Chapter III. EXISTING SOCIOECONOMIC CONDITIONS

The transportation planning process requires that Derry be divided into a series of analysis (traffic) zones, in order to expedite the collection of socioeconomic data affecting trip making, specifically dwelling units, population, employment and automobile ownership. Throughout the report, existing and future data are presented on this traffic zone basis. Figure 9 depicts the 27 traffic zones in Derry, in addition to the 22 external stations used when determining the existing and future internal and external traffic movements.

The following sections describe land use activity, population, dwelling units, employment and automobile ownership on a traffic zone basis.

LAND USE ACTIVITY

Table 2 indicates the development trend for Derry between 1965 and 1976. The town contains 22,784 acres and during this period 2,839 more acres were developed, or an increase of 12.5%. The primary traffic generating land uses of residential, commercial and industrial increased by 2,666 acres or 239%. The vast majority of this increase was in residential acreage which increased from 925 to 3,540 acres. Associated with this increase in residential growth was the increase of acreage devoted to streets and highways, which went from 760 to 938 acres (+178) or an increase of 23%.



TRAFFIC ZONES

LEGEND

INTERNAL ZONES 1-27

EXTERNAL STATIONS 28 - 49

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

Scale: Miles 1 1/2 1 2000 4000 Feet

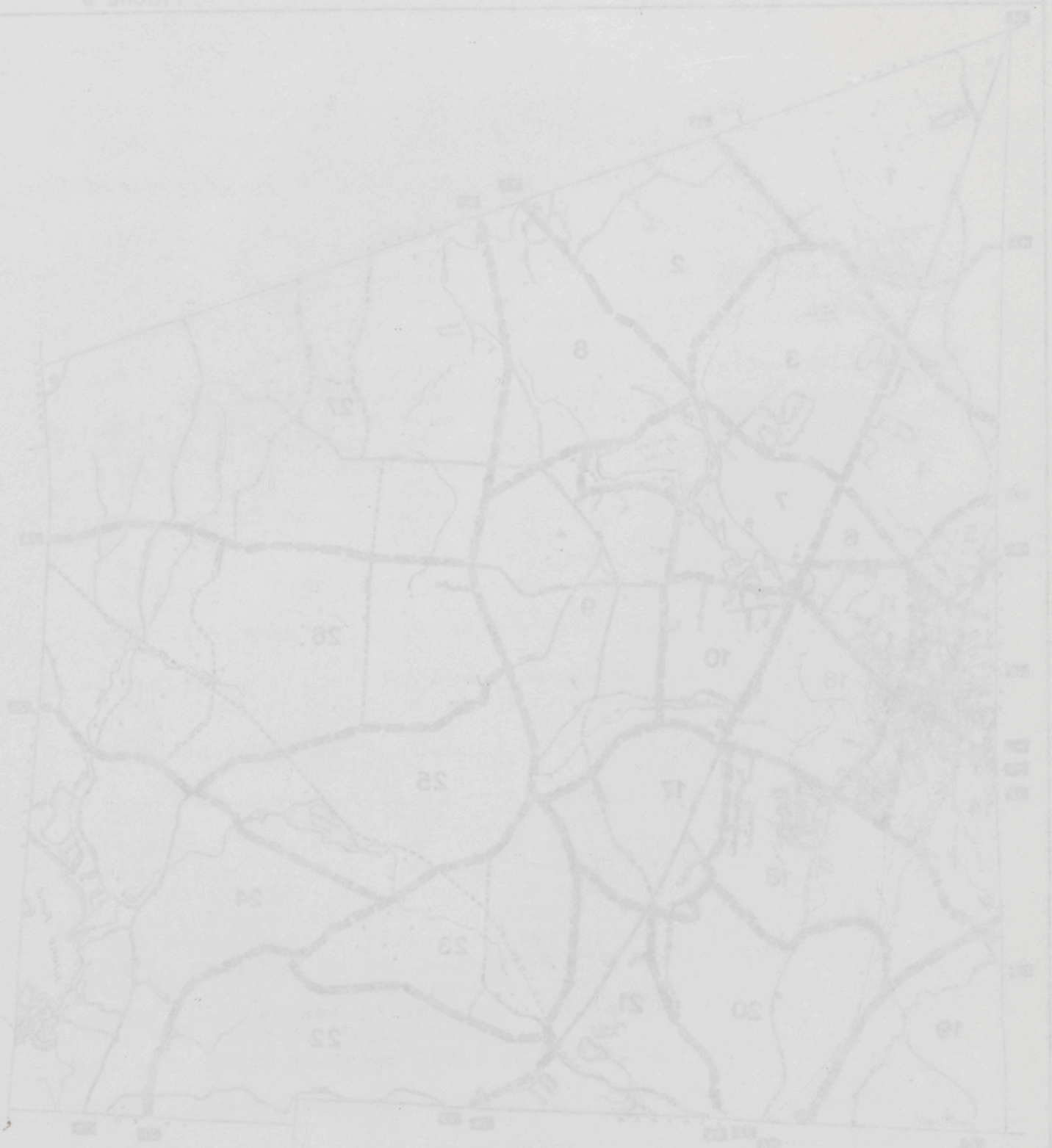


Table 2

Comparison of 1965[1] and 1976[2] Land Use Acreage

	1965	1976	Percent of Total 1965	Percent of Total 1976
Total Residential	925	3,540	4.0%	15.5%
Commercial	95	142	.4	.6
Industrial	92	96	.4	.4
Public, Semi-public & Agricultural	1,545	1,540	6.8	6.8
Sts. and Highways	760	938	3.4	4.2
Vacant[3]	19,367	16,528	85.0	72.5
TOTAL	22,784	22,784	100.0%	100.0%

[1]Background Studies, Comprehensive Planning Program, The Planning Services Group, 1965, Existing Land Use Summary, p. 3.

[2]Monograph for the Town of Derry, Southern New Hampshire Planning Commission, 1983, p. 4.

[3]Includes Water Bodies (386 Acres).

Since 1976, data on acreage by land use has not been available. However, based on the building permit activity, the increases in residential growth continue up to the present time. The exception to this is a period when there was a moratorium on building imposed by the town.

POPULATION AND DWELLING UNITS

The 1983 population and dwelling unit data were the basis for trip generation estimates used in the base year traffic model.

Table 3 shows the past trend in population in Derry. Significant growth occurred between 1960 and 1980, with the population increasing from 6,987 to 18,989 (+12,002 people or +172%). The 1980-1983 statistics indicate an annual increase of about 6%, or comparable to that witnessed during the previous two decades.

Table 4 shows the dwelling unit increase in Derry. Between 1960-1980, dwelling units increased by 4,290 or 152%. Since 1980, 1,205 additional dwelling units have been added, representing a 17% increase above the 1980 total. The associated population per occupied household was 3.1 in 1960, 3.3 in 1970, 2.86 in 1980, and 2.86 in 1983.

Table 3

Population Change - Derry

Year	Population	Number/Percent Change	
1960[1]	6,987		
1970[1]	11,712	+ 4,725	68%
1980[2]	18,989	+ 7,277	62%
1983[3]	22,471	+ 3,482	18%

[1]U.S. Census of Population
[2]U.S. Census of Population, adjusted for missing data
[3]SNHPC Estimate

Table 4

Dwelling Unit Change - Derry

Year	Year-Round Dwelling Units	Number/Percent Change	
1960[1]	2,823		
1970[1]	3,817	+ 994	+35%
1980[2]	7,113	+3,296	+86%
1983[3]	8,318	+1,205	+17%

[1]U.S. Census of Housing
[2]U.S. Census of Housing, adjusted for missing data
[3]SNHPC Estimate

Figures 10 and 11 show the 1983 distribution of population and dwelling units on a traffic zone basis. The greatest densities of population were in zones 1, 14 and 18, while zones 1, 4, 7 and 14 had the greatest densities of dwelling units.

EMPLOYMENT

In the traffic estimation and projection procedure, employment is the variable that expresses the attractiveness, or "pulling power" of a zone. Table 5 presents the employment data for Derry between 1963 and 1983. In that span of time, employment increased from 1,846 to 4,634 or +2,788 (+151%).

The source of employment statistics is the N.H. Department of Employment Security, and there are several factors that need to be explained in terms of the reported statistics. Traditionally, N.H. Department of Employment Security data does not include public employment. The 1983 SNHPC estimate is a combination of N.H. Department of Employment Security data plus a supplementary listing provided by the town and includes public employment within the community. From 1972 on, all employers of three or under are included in the N.H. Department of Employment Security data; prior to that they were excluded.

Figure 12 shows the distribution of employment within the town of Derry. The heaviest concentration is in traffic zone 11, where the Hood Shopping Plaza and other concentrated retail activities on Crystal Avenue are located. The next greatest concentrations were in traffic zones 4 and 5, which represent the industrial areas in Derry. Traffic zones 12 and 15 represent a

POPULATION DISTRIBUTION - 1983

LEGEND

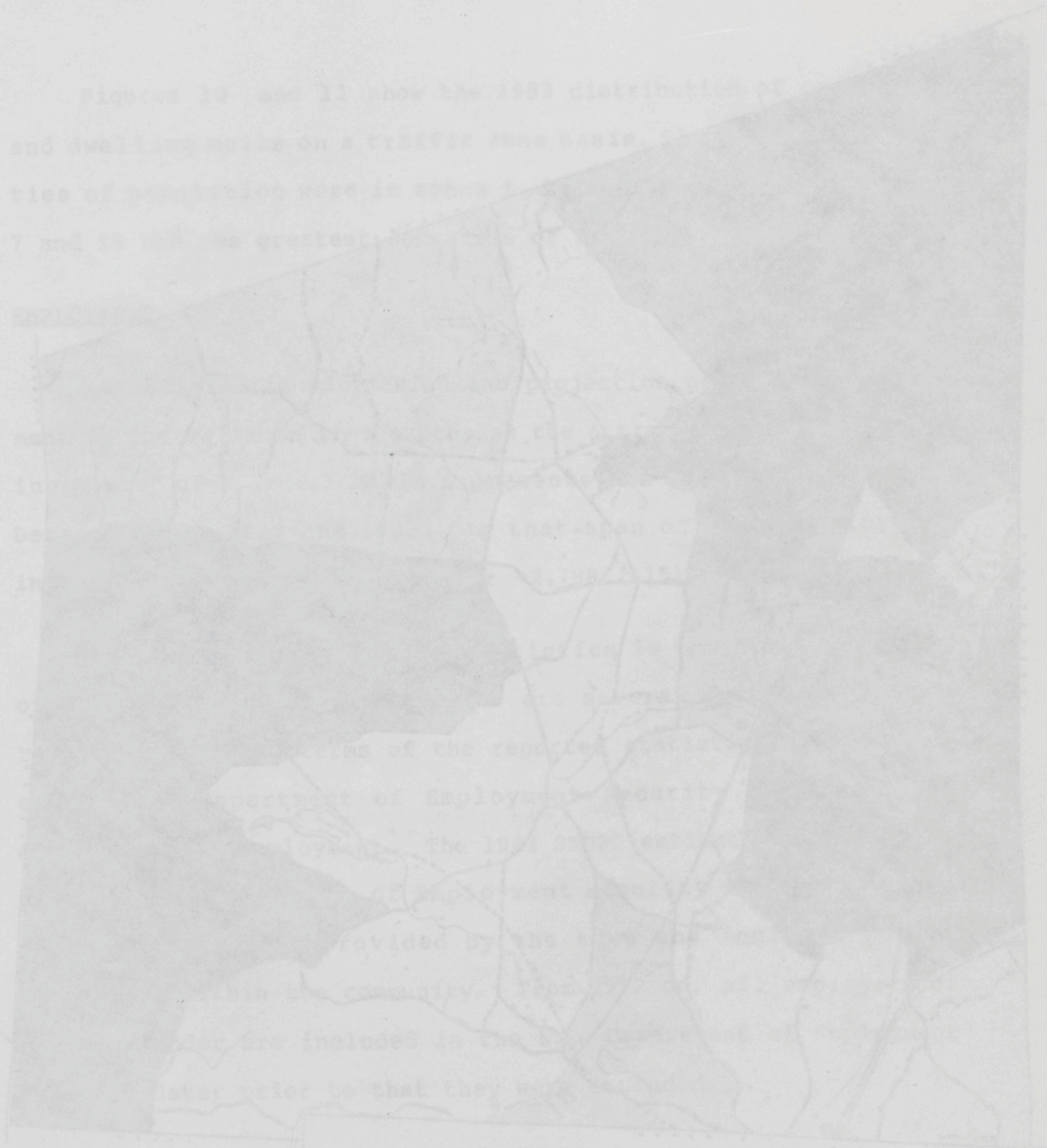
PERSONS/ZONE

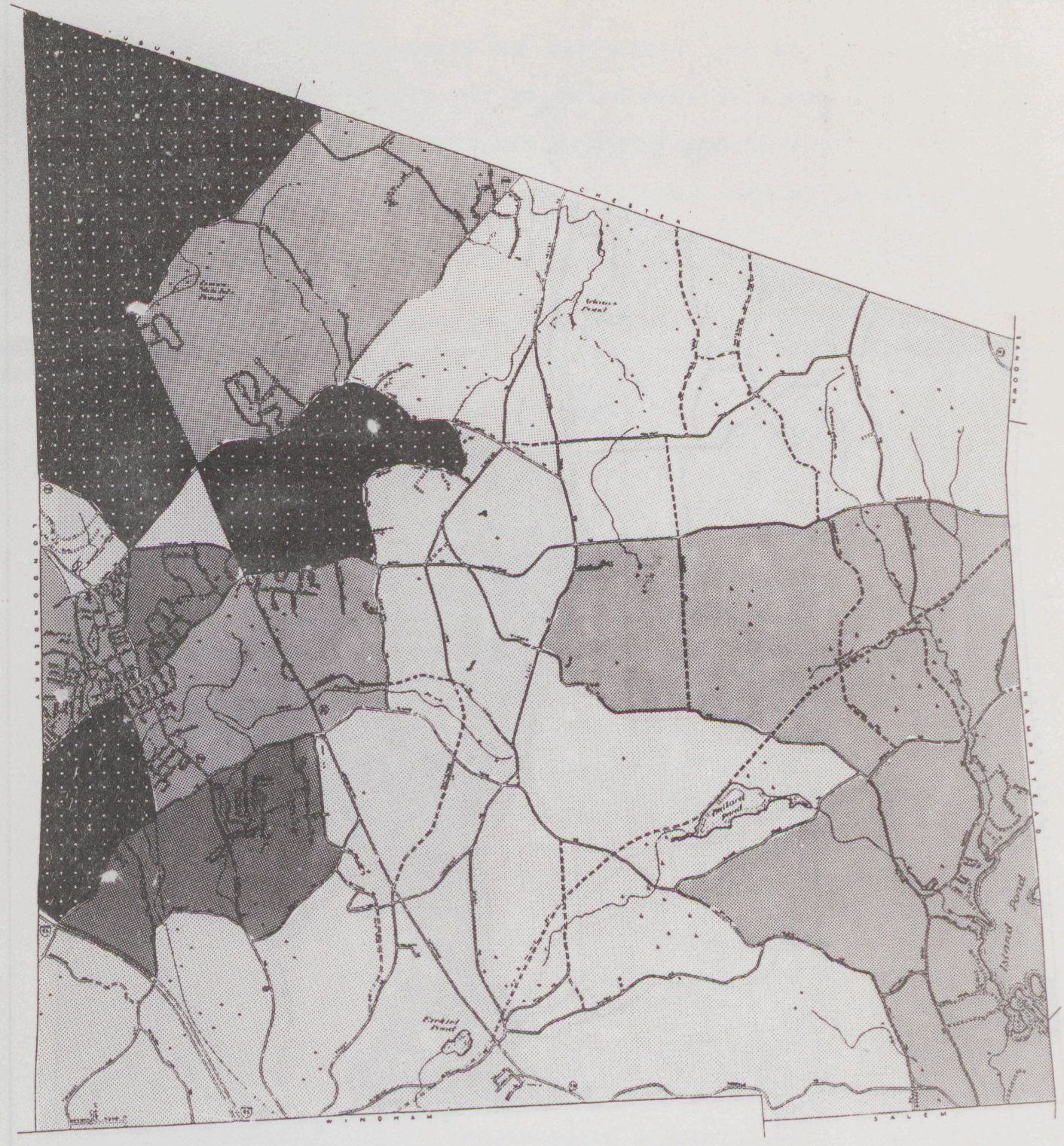
- 0 - 500
- 501 - 700
- 701 - 1000
- 1001 - 1500
- 1501 +

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985





DWELLING UNIT DISTRIBUTION - 1983

LEGEND

UNITS / ZONE

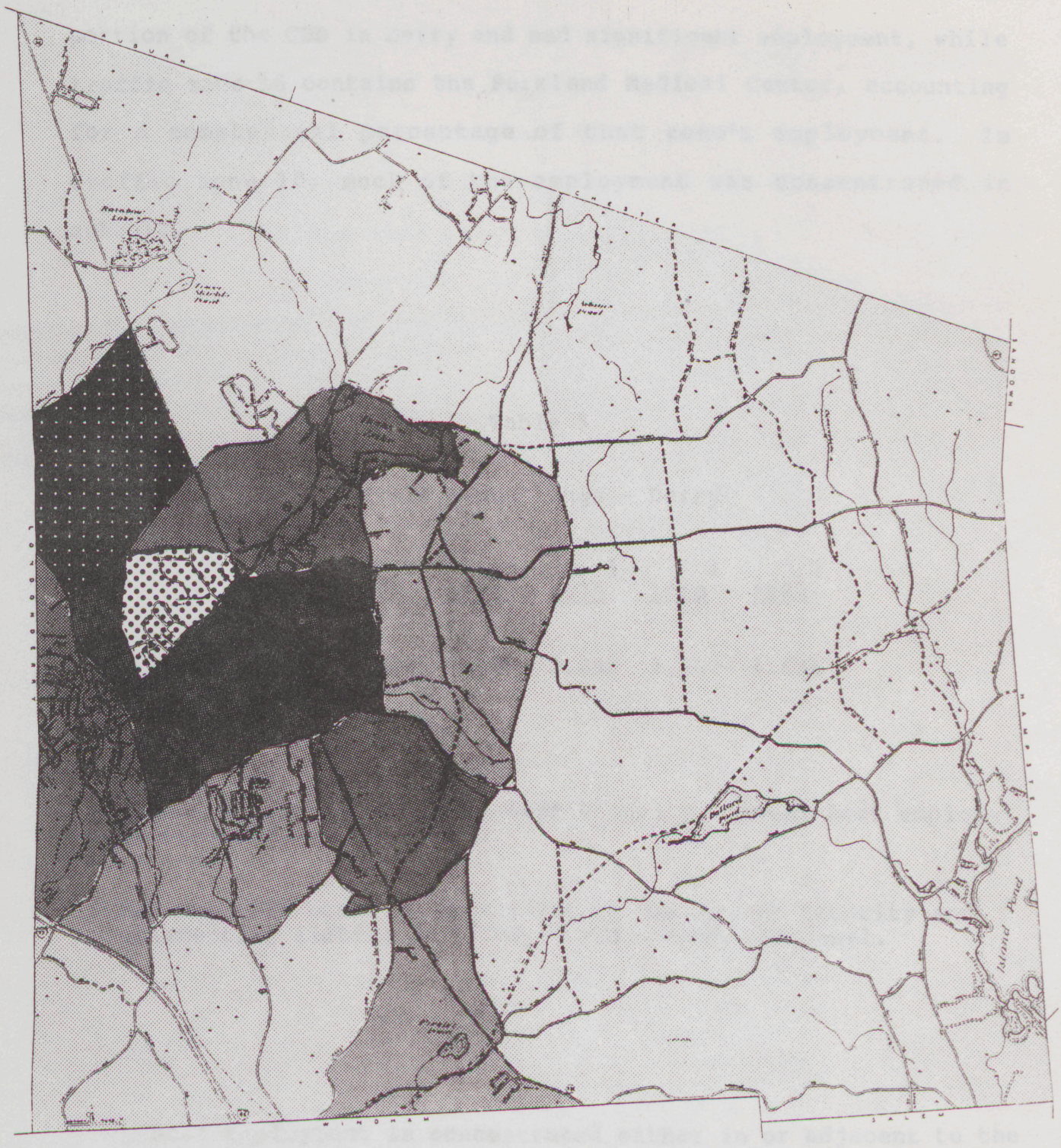
- 1 - 200
- 201 - 500
- 501 - 600
- 601+

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

Scale
Miles 1 1/2 1 2000 4000 Feet



EMPLOYMENT DISTRIBUTION - 1983

LEGEND

EMPLOYEES / ZONE

- 0 – 50
- 51 – 100
- 101 – 200
- 201 – 500
- 501 – 1000
- 1000 +

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

Scale
Miles 1 1/2 1 2000 4000 Feet

portion of the CBD in Derry and had significant employment, while traffic zone 16 contains the Parkland Medical Center, accounting for a substantial percentage of that zone's employment. In traffic zone 10, much of the employment was concentrated in schools.

Table 5

Employment Change - Derry

	1963[1]	1970[1]	1975[1]	1980[1]	1983[2]
Employment	1,846	2,004	2,890	4,367	4,634

[1]Source - Department of Employment Security - government employment excluded.

[2]SNHPC estimate based on Department of Employment Security and supplementary listing provided by Derry town personnel.

Most employment is concentrated either in or adjacent to the CBD and the industrially zoned areas of Derry.

AUTOMOBILE OWNERSHIP

Automobile ownership is an important aspect of trip making, since ready access to autos indicates higher income as well as larger household population. As such, this variable plays an important role in traffic forecasting. The combination of higher income, larger families, and higher auto ownership usually results in greater trips per household.

Table 6 shows change in automobile ownership between 1970 and 1983. Throughout the town, ownership has increased by 10,086 to its present level of 14,685.

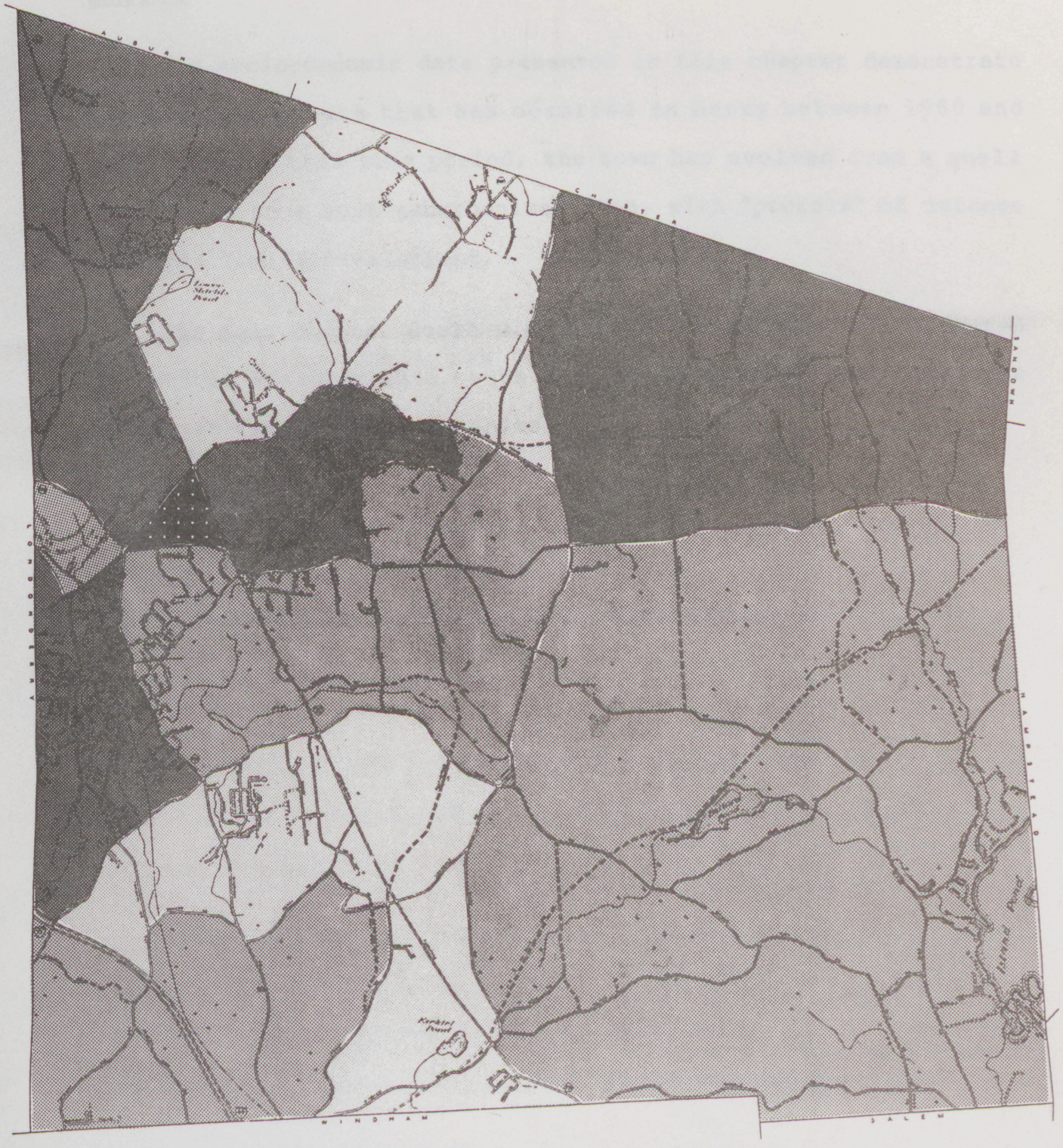
Table 6

Automobile Ownership Change - Derry[1]

1970	1980	1983	Change - 1970-1983 Number	Percent
4,599	12,499	14,685	10,086	+219%

Figure 13 indicates autos per 1,000 people on a traffic zone basis. Traffic zone 6, a predominantly multiple family area, had the largest ownership rate; traffic zones 1, 4, 7, 12, 13, 14, 15 and 27 had the next highest rate.

[1] Based on U. S. Census Data, Automobiles Per Household.



AUTOMOBILE DISTRIBUTION - 1983

LEGEND

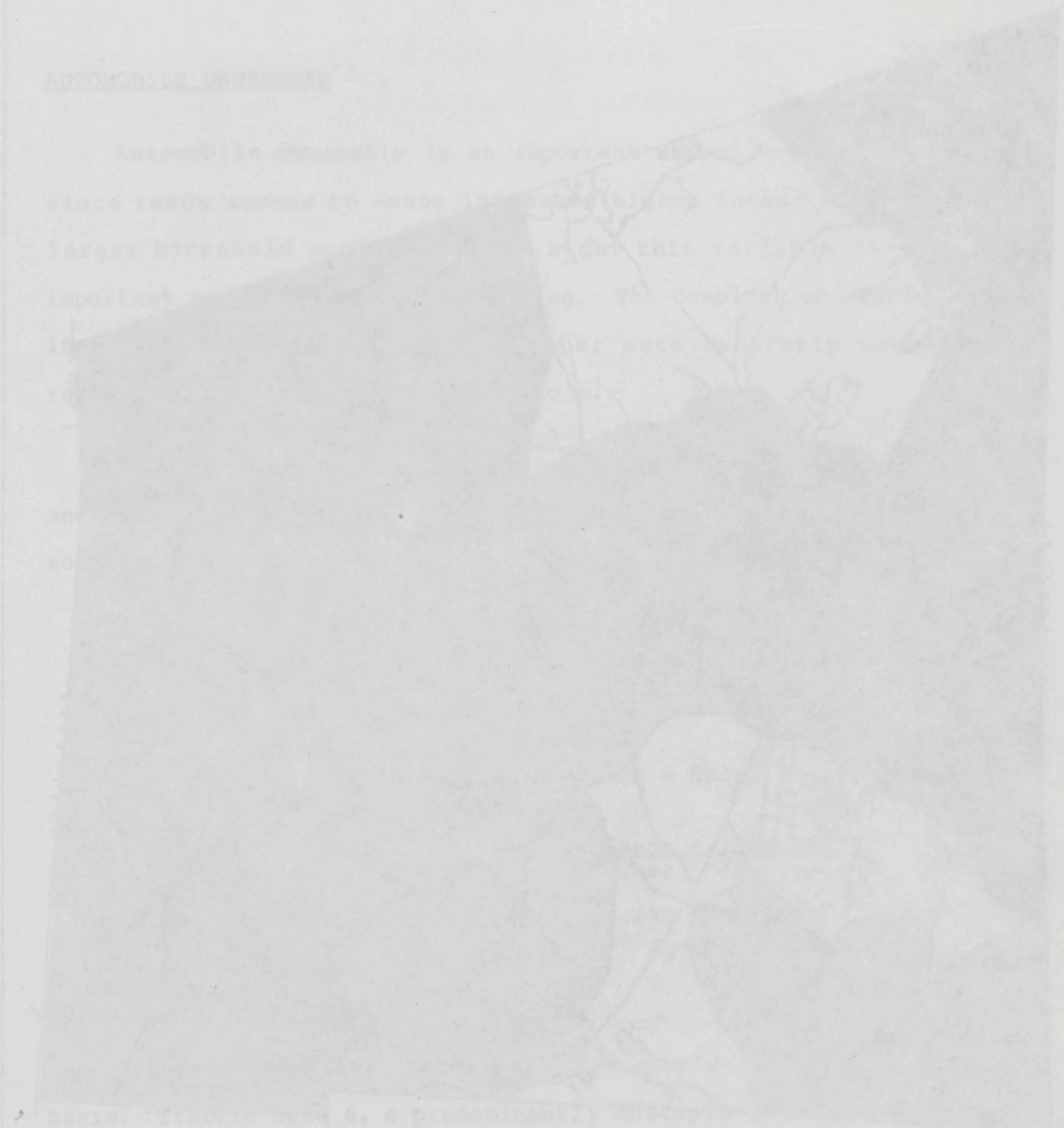
AUTOS PER 1000 PERSONS/ZONE

- 0 - 400
- 401 - 600
- 601 - 700
- 701 - 800
- 801+

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985



SUMMARY

The socioeconomic data presented in this chapter demonstrate the overall growth that has occurred in Derry between 1960 and 1983. During this time period, the town has evolved from a small rural area to a more suburbanized area, with "pockets" of intense multiple family development.

The next chapter deals with future growth, which is expected to exhibit a slower rate, with a shift in housing from multiple to single family dwelling units.

CHAPTER IV. FUTURE SOCIOECONOMIC DATA

OVERVIEW

This chapter presents population, dwelling unit and employment projections for the year 2005. Influences on future growth include land capability in terms of slope and soil conditions, public ownership, predominant wetlands and floodplains, zoning restrictions, available vacant land, existing municipal services, current level and type of building activity, and demographic variables such as fertility, death and migration rates.

Employment projections are affected by planned expansions, zoning, potential business, shares of retail/non-retail functions, and current percentage of the base share in different sectors, e.g., manufacturing, services, retail sales, construction, transportation, communication and utilities, finance, insurance and real estate. Analysis is based on local, state and national trends, augmented by interviews with local officials and economic consultants.

Auto ownership projections were based on the calculations made for the 1983 base year average autos per household. The 1980 U.S. Census was the basis for determining these rates, and they were held constant throughout the projection period.

Tables 7 through 10 present the socioeconomic data for 1983 and for the target year of 2005, and show the number and percent change occurring during this period. Figures 14 through 17 present similar data for the year 2005 on an individual traffic zone basis.

POPULATION

The population of Derry is expected to increase by approximately 11,956 people between 1983 and 2005, or by 53.2%. In the early part of the projection period (1984-1985), there is a population surge caused by sharp increases in multiple family housing units.

Table 7[1]

Derry Population 1983 - 2005

1983	2005	Number/Percent Change	
22,471	34,427	+11,956	+53.2%

[1]SNHPC estimates and projections.

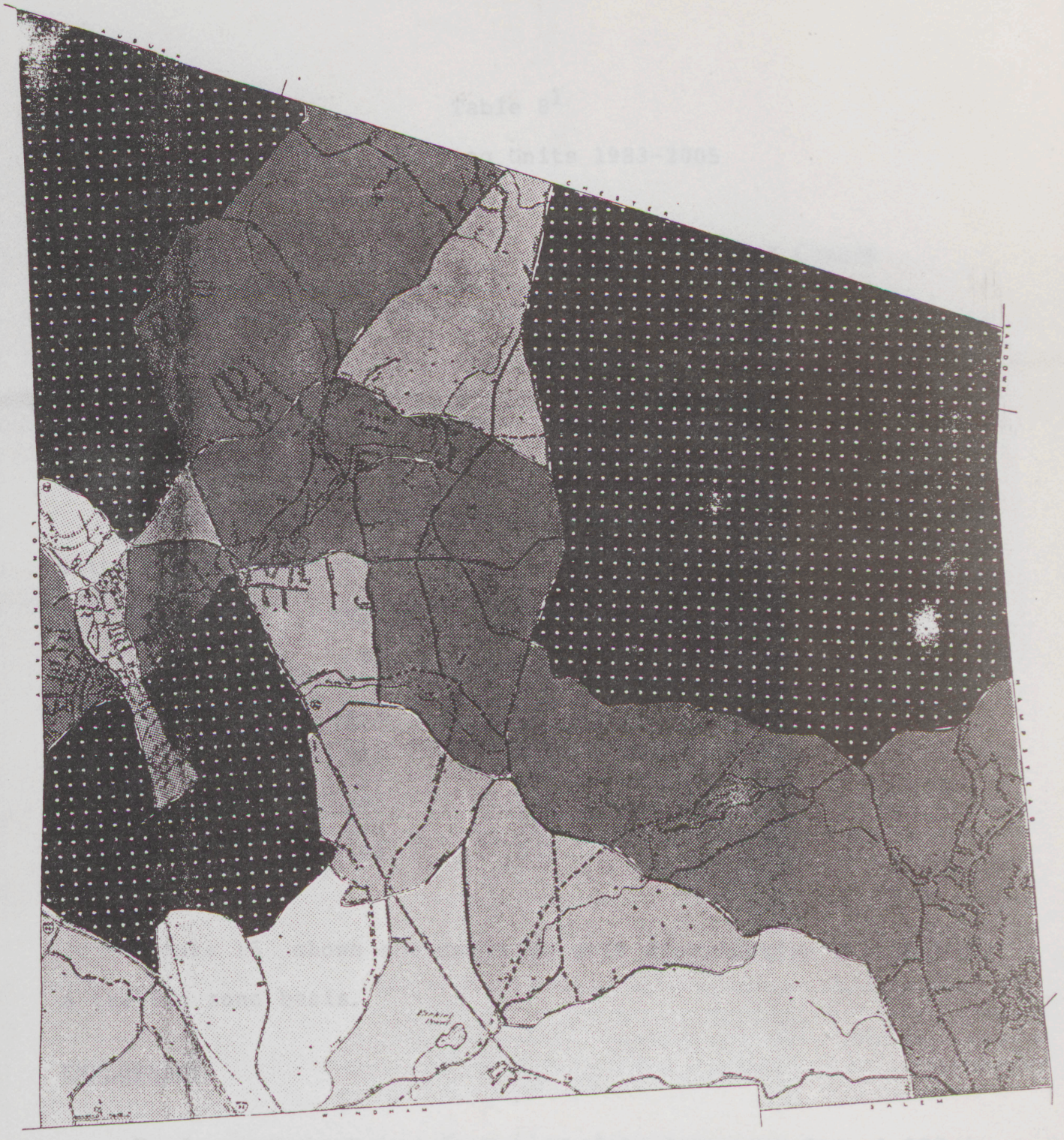
Traffic zones in Derry having significant population growth are noted below:

Zone	1983	2005	% Increase
1	1,760	2,988	+ 70%
6	252	968	284%
8	451	948	110%
9	471	1,224	160%
16	793	2,815	255%
17	448	847	89%
22	452	977	116%
23	196	743	279%
25	313	1,293	313%
26	1,122	2,580	130%
27	552	1,636	196%

Figure 14 shows the projected population distribution on a traffic zone basis.

DWELLING UNITS

Dwelling units in the town of Derry are expected to increase by 4,579 dwelling units between 1983 and 2005. As noted earlier, there is a surge in multiple family housing units during 1984-1985, but this trend ceases because of the saturation of areas so zoned. The projection does incorporate a minimal number of multi-family housing units being constructed after 1985.



POPULATION DISTRIBUTION - 2005

LEGEND

PERSONS/ZONE

- 0 - 500
- 501 - 700
- 701 - 1000
- 1001 - 1500
- 1501 +

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

Table 8[1]

Derry Dwelling Units 1983-2005

1983	2005	Number/Percent Change	
8,318	12,897	+4,579	+55%

[1]SNHPC estimates and projections.

Traffic zones in Derry having significant growth in dwelling units are noted below:

Zone	1983	2005	% Increase
1	647	1,072	+ 66%
6	154	512	232%
8	124	296	138%
9	151	410	171%
16	311	1,322	325%
23	67	257	283%
25	107	446	317%
26	383	717	131%
27	188	563	199%

Figure 15 shows the dwelling unit distribution for 2005 on a traffic zone basis.

EMPLOYMENT

Employment in Derry is expected to increase from 4,958 in 1983 to 7,075 in the year 2005, or by +2,117. This is approximately a 2% annual growth rate. Allocation of this increase was based on zoning, existing business expansions, and new businesses. The projection also considers shares, or current percent of base employment by sector, e.g., industrial, services, etc.

DWELLING UNIT DISTRIBUTION - 2005

LEGEND

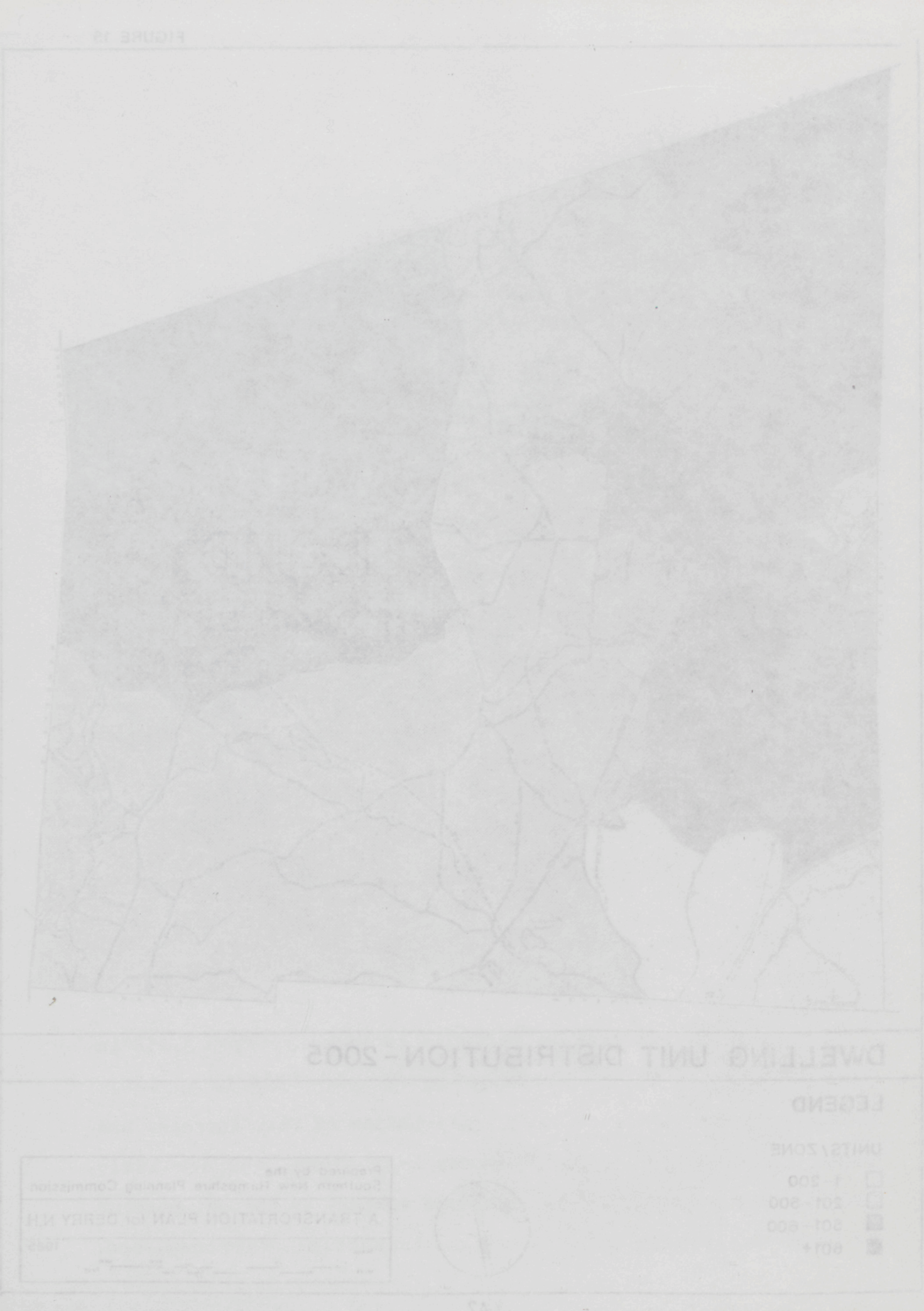
UNITS / ZONE

- 1 - 200
- 201 - 500
- 501 - 600
- 601+

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985



The ratio of employment to population will be approximately .22 since many Derry residents work outside of, as opposed to within, Derry.

Table 9

Derry Employment Changel 1983-2005

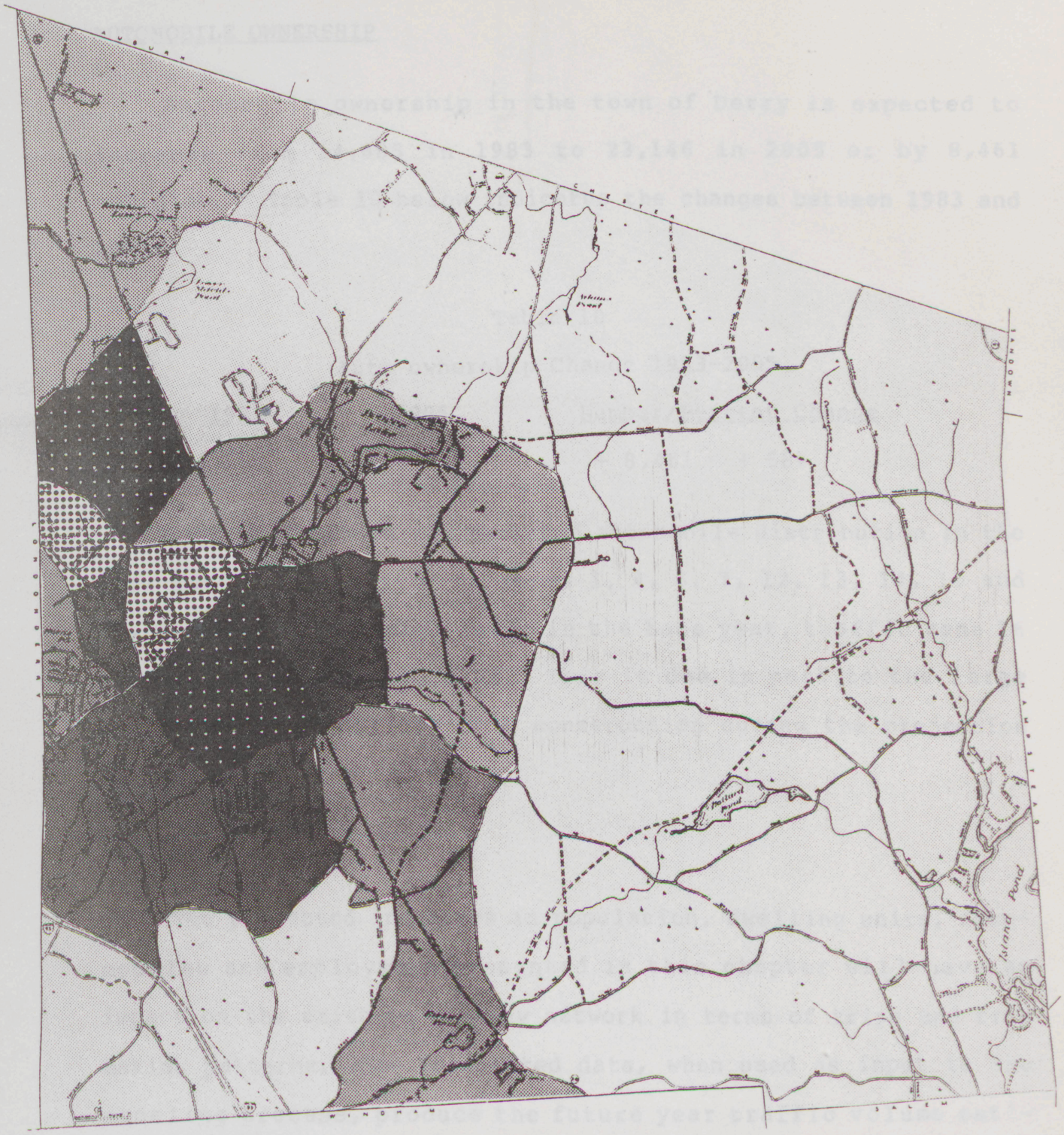
1983	2005	Number/Percent Change
4,958	7,075	2,117 + 42.7%

[1]N. H. Dept. of Employment Security amended and SNHPC projection.

Zones having significant increases in employment are shown below:

Zone	1983	2005	% Increase
4	771	966	25%
5	757	1,083	43%
12	224	393	75%
14	120	415	245%
16	306	587	92%
17	100	189	89%
18	60	288	380%
21	61	139	127%

Figure 16 shows employment distribution on a traffic zone basis for the year 2005.



EMPLOYMENT DISTRIBUTION - 2005

LEGEND

EMPLOYEES / ZONE

- 0 - 50
- 51 - 100
- 101 - 200
- 201 - 500
- 501 - 1000
- 1000 +

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

AUTOMOBILE OWNERSHIP

Automobile ownership in the town of Derry is expected to increase from 14,685 in 1983 to 23,146 in 2005 or by 8,461 vehicles. Table 10 below indicates the changes between 1983 and 2005.

Table 10

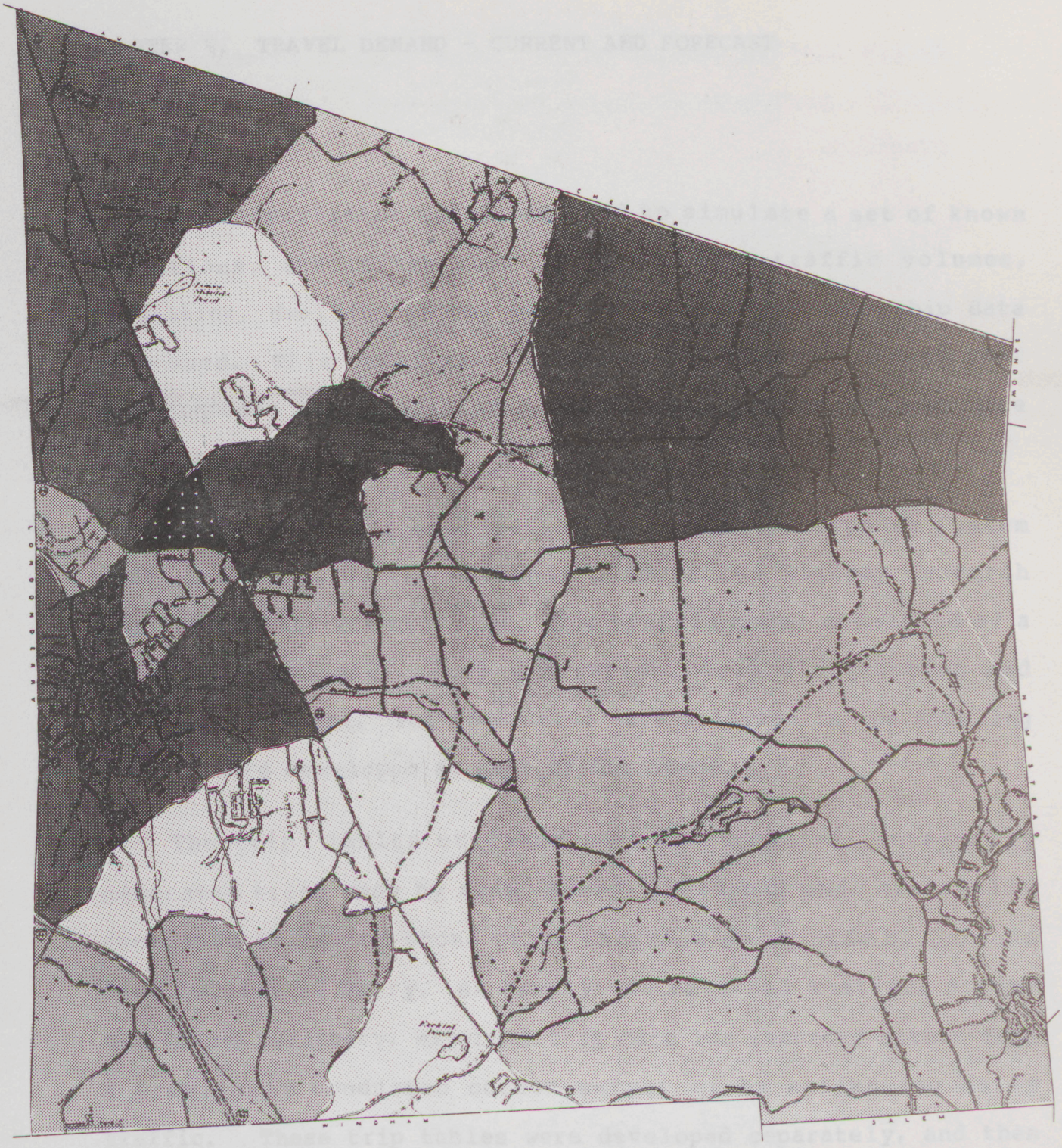
Auto ownership Change 1983-2005

1983	2005	Number/Percent Change
14,685	23,146	+ 8,461 + 58%

Figure 17 shows the expected automobile distribution in the year 2005. In addition to zones 1, 4, 6, 7, 12, 13, 14, 15 and 27, which had the higher rates in the base year, traffic zone 16 has experienced an increase. This is due in part to the large scale multiple dwelling unit construction during the projection period.

SUMMARY

The projected increases in population, dwelling units, automobiles and employment presented in this chapter will have an impact on the existing highway network in terms of trips and trip making patterns. The forecasted data, when used as input to the modeling process, produce the future year traffic volume estimates. These future volumes reflect the land use changes, geographic shifts in employment, dwelling unit distribution and increased trips caused by more autos, indicating where the existing highway network might be inadequate to accommodate the demand.



AUTOMOBILE DISTRIBUTION - 2005

LEGEND

AUTOS PER 1000 PERSONS / ZONE

- 0 - 400
- 401 - 600
- 601 - 700
- 701 - 800
- 801+

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

CHAPTER V. TRAVEL DEMAND - CURRENT AND FORECAST

OVERVIEW

A transportation model was used to simulate a set of known conditions, and in the case of Derry, 1983 traffic volumes, population, dwelling units, employment, and auto ownership data were used. This model was then supplied with the future year socioeconomic statistics; thus future year traffic volumes were determined.

A microcomputer application of the Quick Response System (QRS) developed by the National Cooperative Highway Research Program (NCHRP) was utilized. The traffic model consisted of a three step process: trip generation, trip distribution and traffic assignment. The forecasted data utilized in the modeling process were developed as part of the study.

The trip tables utilized were the total of: internally generated trips made by area (Derry) residents and externally generated trips; or those trips entering Derry made by persons from outside of Derry. At twenty-two external stations around the town's periphery, external trip data was recorded either from a previously conducted cordon survey or by estimating daily traffic. These trip tables were developed separately, and then combined prior to assigning traffic.

The 1983 existing Derry street and highway network as well as proposed alternate bypasses were used for making current and

future traffic assignments. This procedure showed the shifts in traffic that occur on major roadways when parallel facilities are provided.

TRIP GENERATION

Forecasted traffic volumes require that the relationship between trip making and the socioeconomic characteristics of the population (those making trips) be established in the base year. The basis for this relationship has been derived from a number of urban transportation planning studies. The time period for the survey data is between 1965 and 1974. The Average Daily Trip rates were reported in the 1974 National Transportation Report (16) which represents an estimate of conditions in 1971 and as expected in 1989. The detailed trip generation characteristics for an urbanized area having a population of 25,000-50,000 are used in the study, since this population range is similar to the existing and projected population of Derry.

The trip generation (or production) rates used for the study are shown in Table 11. The basis for the average daily person trips per household is the average autos per household. The percentages of home based work (HBW), home based non-work (HBNW) and non-home based (NHB) do not equal 100%, since they have been reduced by the average auto occupancy rates to convert person trips into vehicle trips. Occupancy rates used were as follows:

Base Year
- HBW - 1.24 based on cordon survey
- HBNW - 1.9 based on average of cordon and home interview survey (Londonderry)
- NHB - 1.6 based on average of cordon and home interview survey (Londonderry)

Future Year
- HBW - 1.33 based on South Manchester-Londonderry Sub-Area Study
- HBNW - 2.26 Transportation Study, Comsis Corporation, July, 1981
- NHB - 1.82 Transportation Study, Comsis Corporation

Table 11

Production Rates Derry

	<1> AVG AUTOS PER HH	<2> AVERAGE DAILY PERSON TRIPS/HH	<3> PERCENT HBW	<4> TRIPS BY HBNW	<5> PURPOSE NHB
1>	0.59	5.70	19.00	28.00	14.00
2>	0.83	8.10	18.00	28.00	14.00
3>	0.91	9.30	17.00	29.00	15.00
4>	1.02	11.10	14.00	29.00	16.00
5>	1.08	12.80	13.00	10.00	15.00
6>	1.16	14.10	12.00	33.00	14.00
7>	1.23	15.40	12.00	33.00	14.00
8>	1.33	16.50	11.00	33.00	14.00
9>	1.47	17.80	11.00	33.00	15.00
10>	1.67	19.30	10.00	34.00	15.00
11>	1.79	19.70	9.00	34.00	16.00
12>	1.90	20.20	8.00	33.00	17.00
13>	1.98	20.40	8.00	33.00	17.00

The trip attraction equations state that the number of trips attracted for a given trip purpose, e.g., non-home based, is a function of total employment, retail employment, non-retail employment, and dwelling units. The attraction equations used in this study are shown in Table 12.

Table 12

TRIP ATTRACTION EQUATIONS

Home Based Work = 1.70 (TOTAL EMPLOYMENT)

Home Based Non-Work = 10.00 (RETAIL EMPLOYMENT) + .50 (NON-RETAIL EMPLOYMENT) + 1.00 (DWELLING UNITS)

Non-Home Based = 2.00 (RETAIL EMPLOYMENT) + 2.5 (NON-RETAIL EMPLOYMENT) + .50 (DWELLING UNITS)

From the trip production rates and trip attraction equations, the 1983 estimate of auto trip productions and attractions (or trip ends) for each internal zone were developed. To these were added the productions and attractions at the external stations obtained from the cordon study and estimates of average daily traffic. To obtain the production and attractions for the year 2005, the auto occupancy rates were increased in keeping with the South Manchester-Londonderry Sub-Area Study assumptions; the future year zone data was used in the attraction equations; and the external station data was factored up by 1.5 to be consistent with existing county projections.

Table 13 shows the auto trip end estimates by purpose for the base (1983) and future (2005) years.

Table 13

AUTO TRIP ENDS - BASE & FUTURE YEAR

Trip Purpose	1983[1]	% of Total	2005[1]	% of Total
HBW	31,522	14	45,127	15
HBNW	115,038	53	151,046	50
NHB	73,734	33	104,032	35
	219,294	100	300,205	100

1983-2005 = 80,911 trip ends, or +37%

[1]Daily internal to internal and internal to external auto trip ends

Source: QRS Travel Demand Model

These statistics indicate a growth of 37% in trip ends between 1983 and 2005, or 80,911 additional trip ends. Derry's increased productions and attractions for the year 2005 reflect the facts that employment (in Derry) is expected to increase by 2,117 jobs, dwelling units by 4,579, population by 11,956, and automobiles by 8,461. The projected growth for Derry is consistent with that projected for the county, and most of the suitable vacant developable land will have been utilized[1].

[1] Approximately 425 acres of suitable vacant developable land left in the year 2005.

The basic output from the trip generation procedure is the quantity of weekday trips produced and attracted by each of the 49 zones. These trip ends are then input into the trip distribution phase, where they are paired by origin and destination zones, which translates into actual vehicle trips between the zones.

TRIP DISTRIBUTION

The trip distribution phase in the travel forecasting process involved two phases. The first was the preparation of a travel time matrix which reflected the required travel time between zones, including in-vehicle time plus total origin-destination terminal times. A town map was prepared showing the central business district, the central city, and the suburban areas of Derry. The traffic zones and zone centroids were also added to the map. The airline distance between each zone was converted to travel time using a series of graphs. In order to utilize the graphs, the airline distance between zones; the percent of the trips made on arterials; the portion of the trip by subarea type, i.e., suburb to suburb, suburb to central city, central business district to suburb, needed to be defined. Knowing these factors, the total travel time (in-vehicle plus origin/destination terminal times) and the appropriate distribution factor were read off the graphs.

The second phase involved the development of trip tables representing auto trips having one or both ends inside the Derry Study Area (internal to internal and internal to external).

The gravity model was used to distribute the trip ends, representing internal to internal trips and internal to external trips. The gravity model formula basically states that the number of trips between zones is proportional to the attractiveness of all zones, or

$$T_{ij} = \frac{P_i A_j F(t)_{ij}}{\sum_{j=i}^{n} A_j F(t)_{ij}}$$

where:

T_{ij} = the number of trips produced in zone i and attracted to zone j.

P_i = the trips produced in Zone i

A_j = the trips attracted to zone j

$F(t)_{ij}$ = the travel time factor for interchange i - j (based on travel time between i and j)

i = origin zone

j = destination zone

n = number of zones in the study area.

To this table was added a trip table consisting of external to external, or "through" trips. Combining all the tables produced the vehicle trip tables for 1983 and 2005. The following table shows the composition of Derry trips:

Table 14

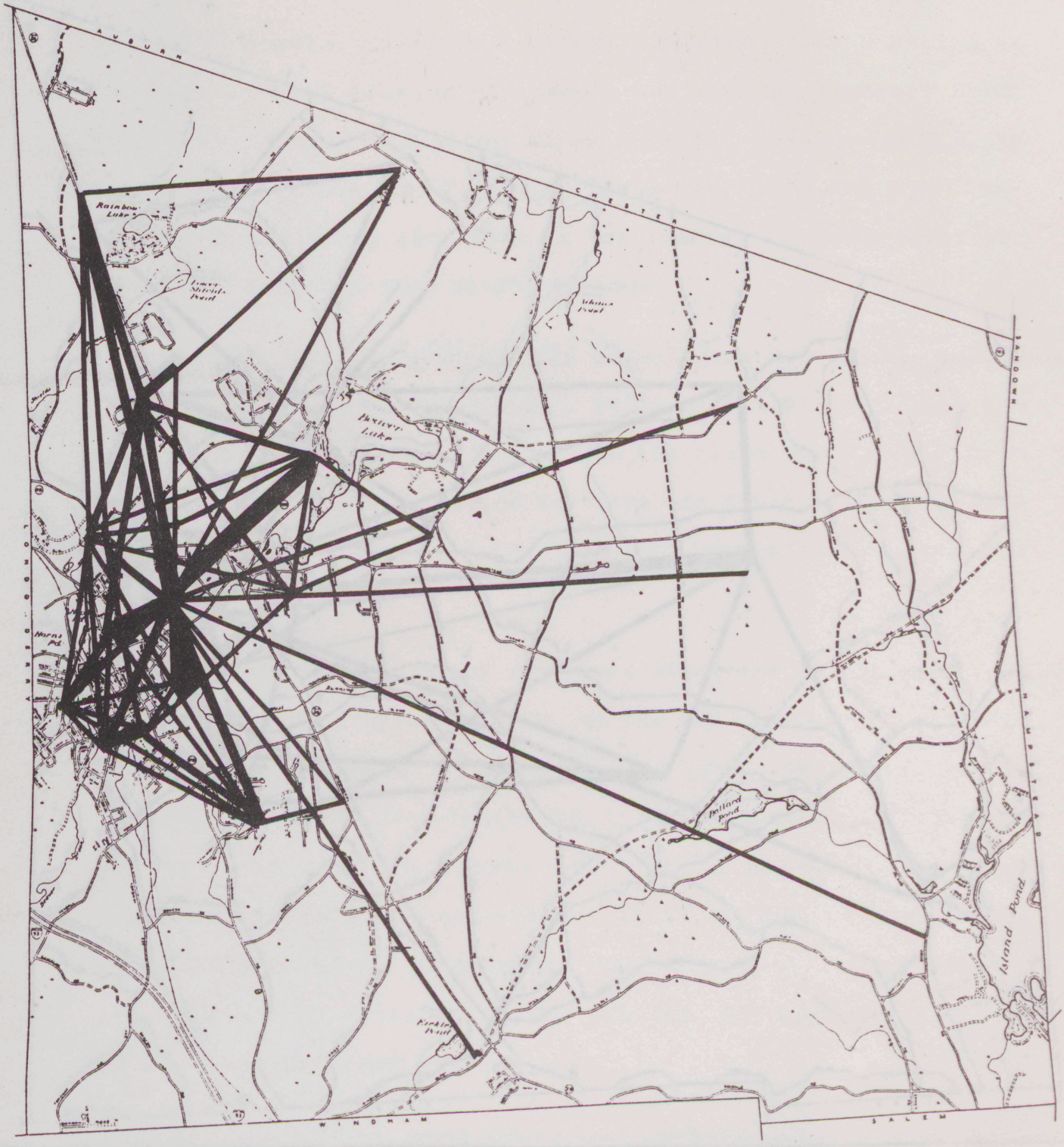
VEHICLE TRIPS - BASE AND FUTURE YEAR

TO DERRY ZONES	VEHICLE TRIPS PER DAY 1983	2005
From Derry (I-I)	62,960	77,714
From External Zones (I-E)	46,093	71,292
Through Trips (E-E)	6,961	10,829
TOTAL	116,014	159,835

The trip tables prepared for 1983 and 2005 provided information on geographic areas having high trip interchanges (volumes). Corridors for operating and capacity analysis were identified in this manner.

In order to present these statistics in a meaningful way, Figures 18 through 23 were prepared. Trips beginning and ending in Derry are shown separately in Figures 18 & 19 for 1983 and 2005; trips originating in Derry and terminating outside Derry (or vice versa) are shown in Figures 20 & 21 for 1983 and 2005; and trips passing through the study area are shown in Figure 22 & 23 for 1983 and 2005. The travel desires help to isolate the major traffic demands. For clarity, only the trip interchanges of 200 or more have been included in the figures.

Figures 18 & 19 show the travel desires of internal trips during the current and projected year. Major trip making is concentrated in the west central section of Derry, and this pattern intensifies for projected traffic. As a result of



TRAVEL DESIRES 1983 INTERNAL – INTERNAL TRIPS

LEGEND

10,000
7500
5000
2500

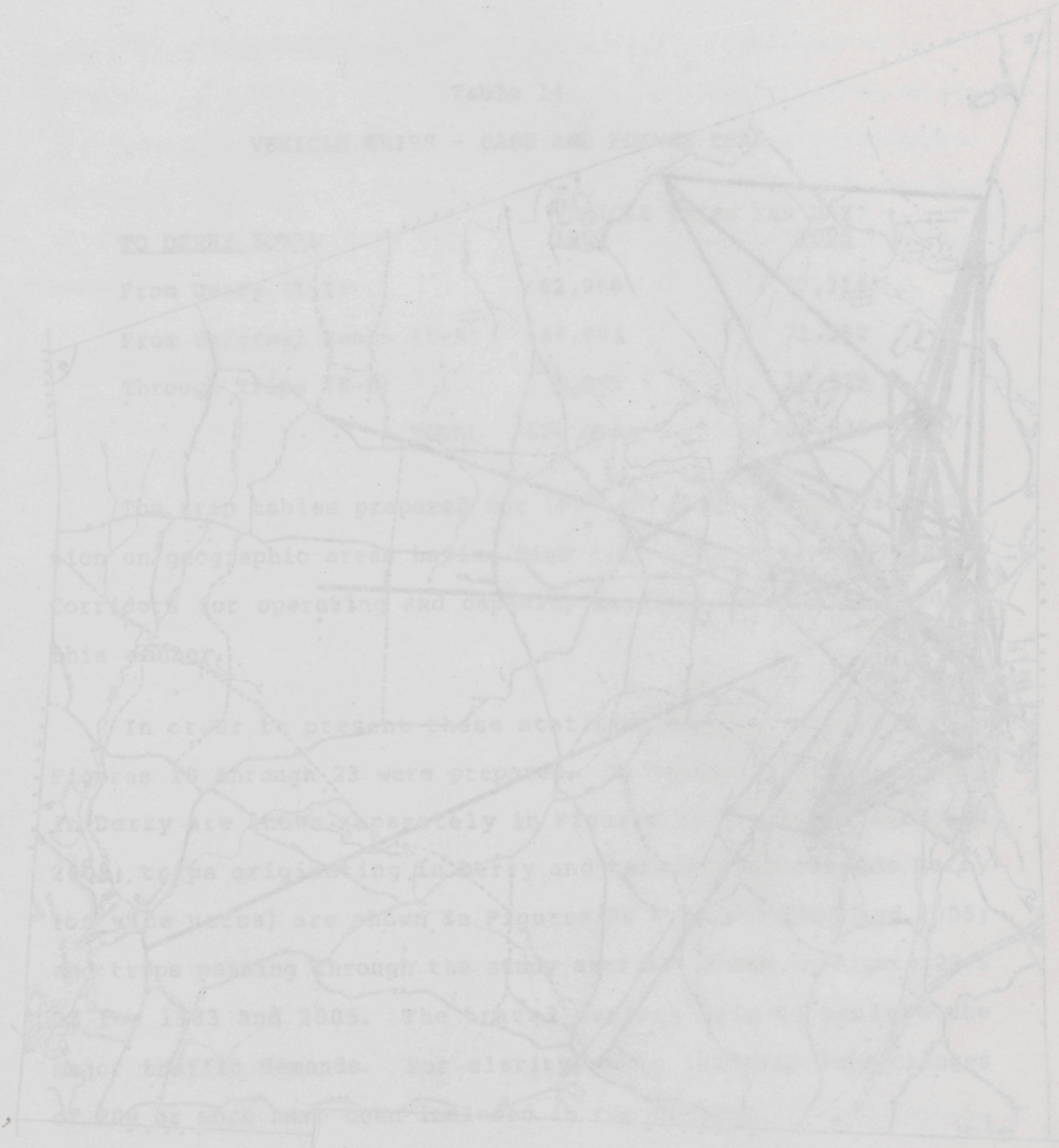
VEHICLE TRIPS

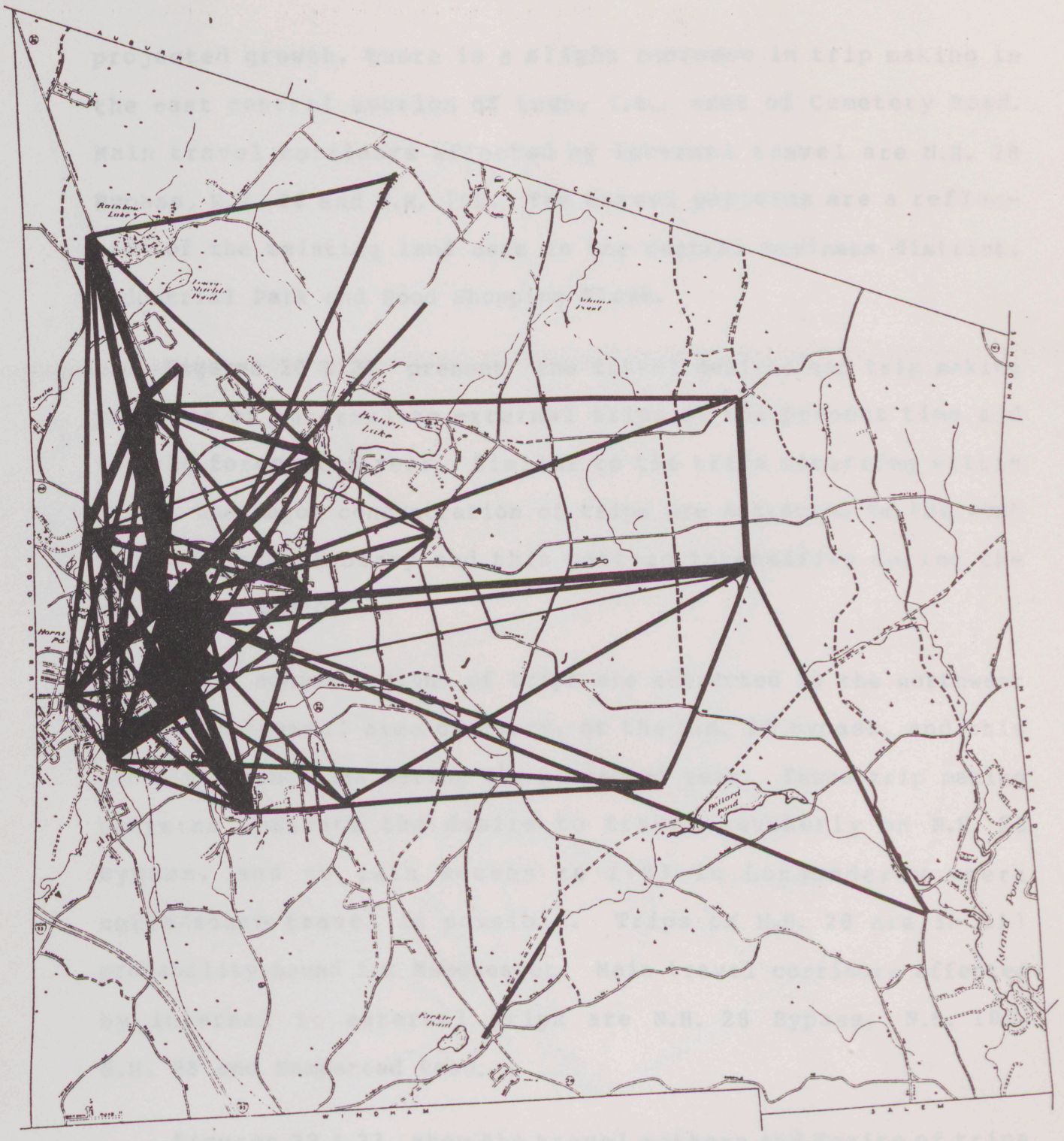
Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

Scale: Miles 1 1/2 0 2000 4000 Feet





TRAVEL DESIRES 2005 INTERNAL – INTERNAL TRIPS

LEGEND

10,000
7500
5000
2500

VEHICLE TRIPS

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

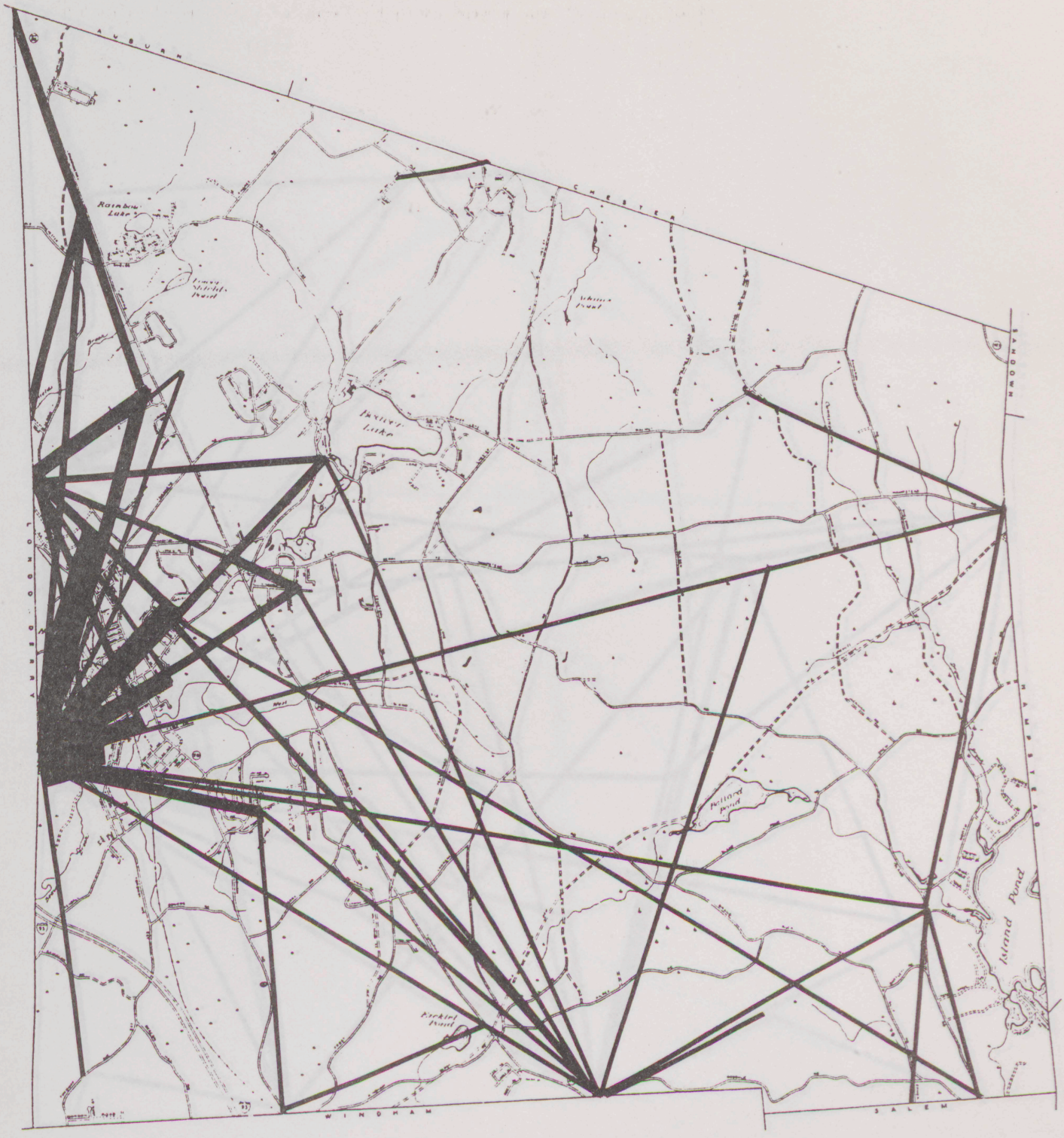
Scale: Miles 1 1/2 0 2000 4000 Feet

projected growth, there is a slight increase in trip making in the east central section of town, i.e., east of Cemetery Road. Main travel corridors affected by internal travel are N.H. 28 Bypass, N.H. 28 and N.H. 102. The travel patterns are a reflection of the existing land uses in the central business district, Industrial Park and Hood Shopping Plaza.

Figures 20 & 21 present the travel desires and trip making patterns of internal to external trips at the present time and for the forecasted year. Similar to the trips occurring within Derry, the major concentration of trips are attracted to the west central area of Derry and this pattern intensifies during the projection period.

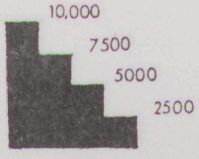
Other concentrations of trips are attracted to the northwest and south central area of Derry, at the N.H. 28 Bypass, and this pattern intensifies during the projected year. These trip making patterns indicate the desire to travel southerly on N.H. 28 Bypass, and to gain access to I-93 in Londonderry where north/south travel is possible. Trips on N.H. 28 are in all probability bound for Manchester. Main travel corridors affected by internal to external trips are N.H. 28 Bypass, N.H. 102, N.H. 28 and Hampstead Road.

Figures 22 & 23 show the travel pattern and desire of trips passing through Derry during the current and projected year. Major travel occurs in the N.H. 102 corridor in the base year, and intensifies during the projected year. Travel in the N.H. 28



TRAVEL DESIRES 1983 INTERNAL – EXTERNAL TRIPS

LEGEND



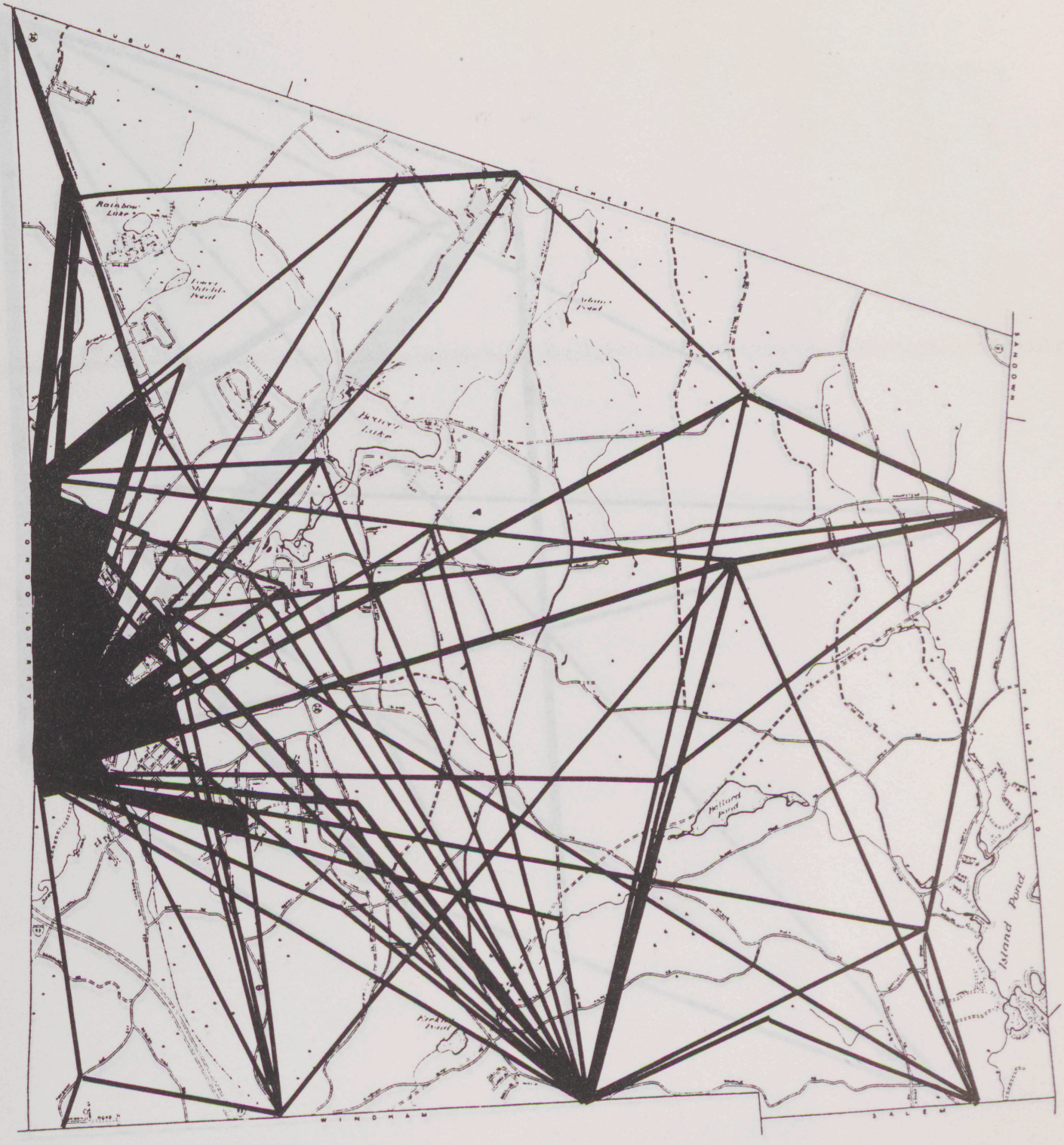
VEHICLE TRIPS

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

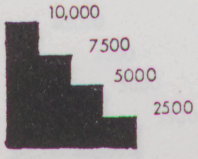
1985

Scale.
Miles 1 1/2 0 2000 4000 Feet



TRAVEL DESIRES 2005 INTERNAL – EXTERNAL TRIPS

LEGEND



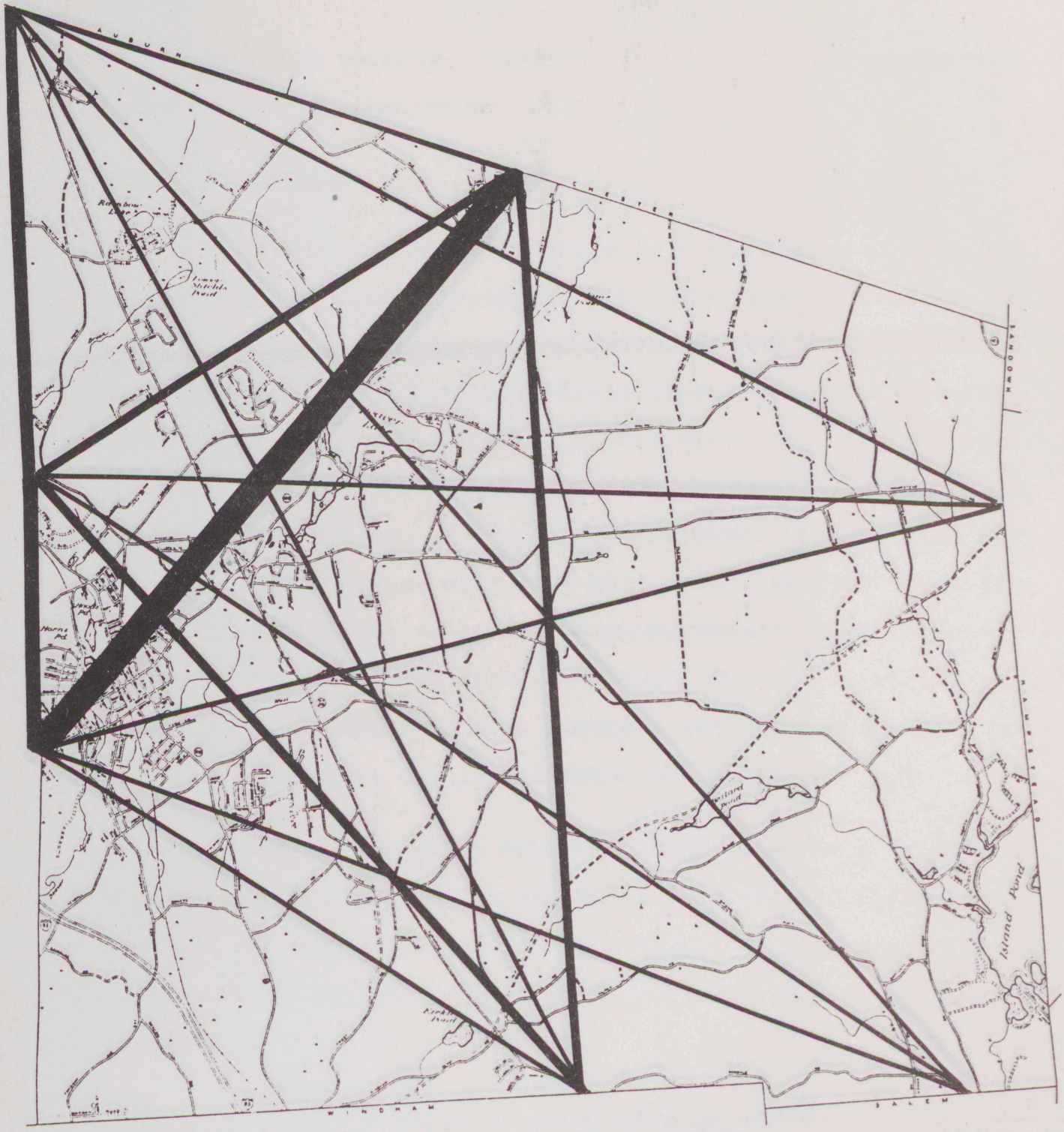
VEHICLE TRIPS

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

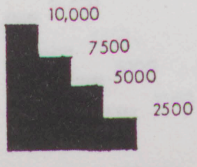
1985

Scale
Miles 1 1/2 0 2000 4000 Feet



TRAVEL DESIRES 1983 EXTERNAL – EXTERNAL TRIPS

LEGEND

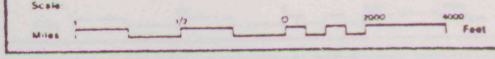


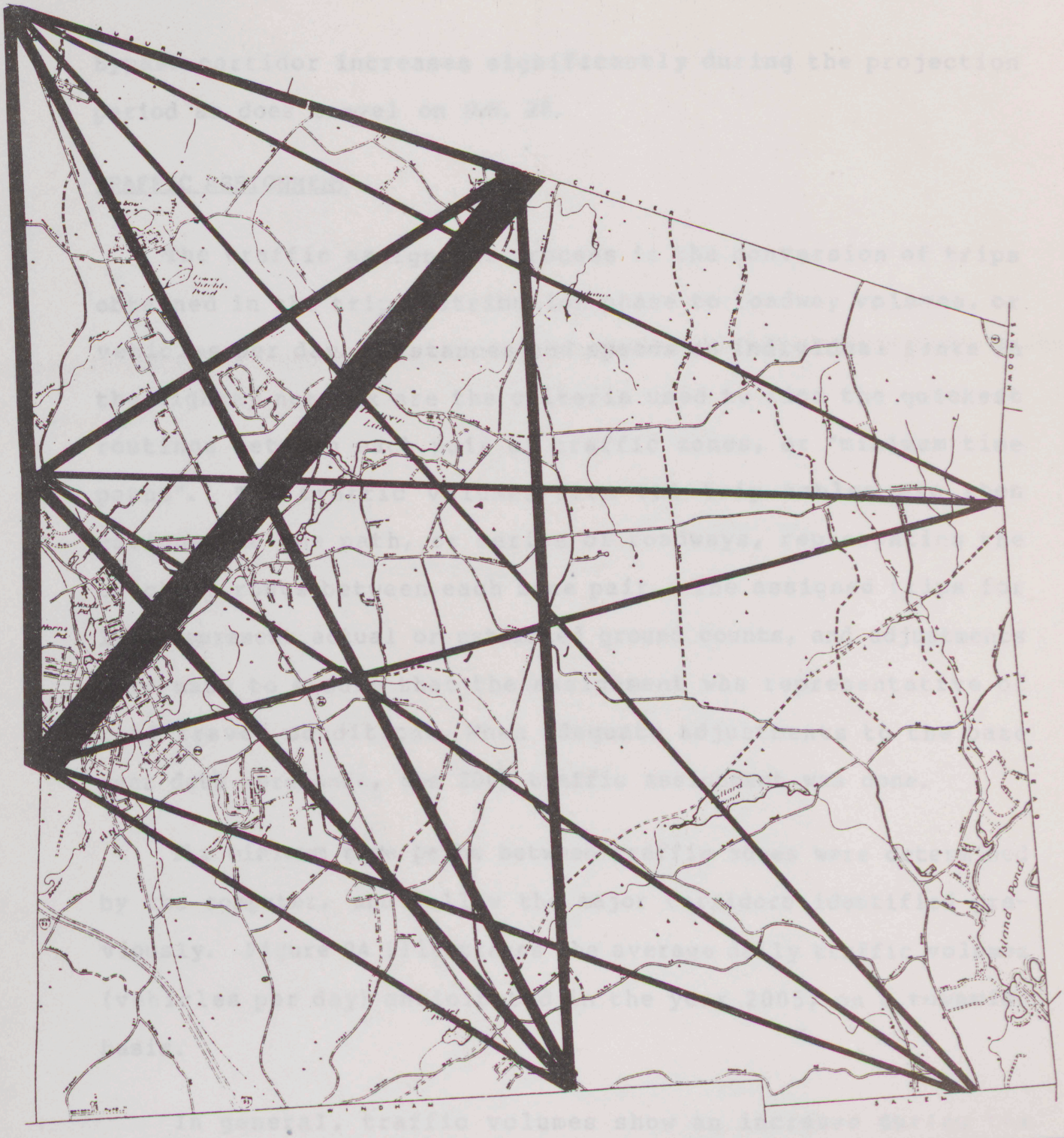
VEHICLE TRIPS

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985





TRAVEL DESIRES 2005 EXTERNAL - EXTERNAL TRIPS

LEGEND

10,000
7500
5000
2500

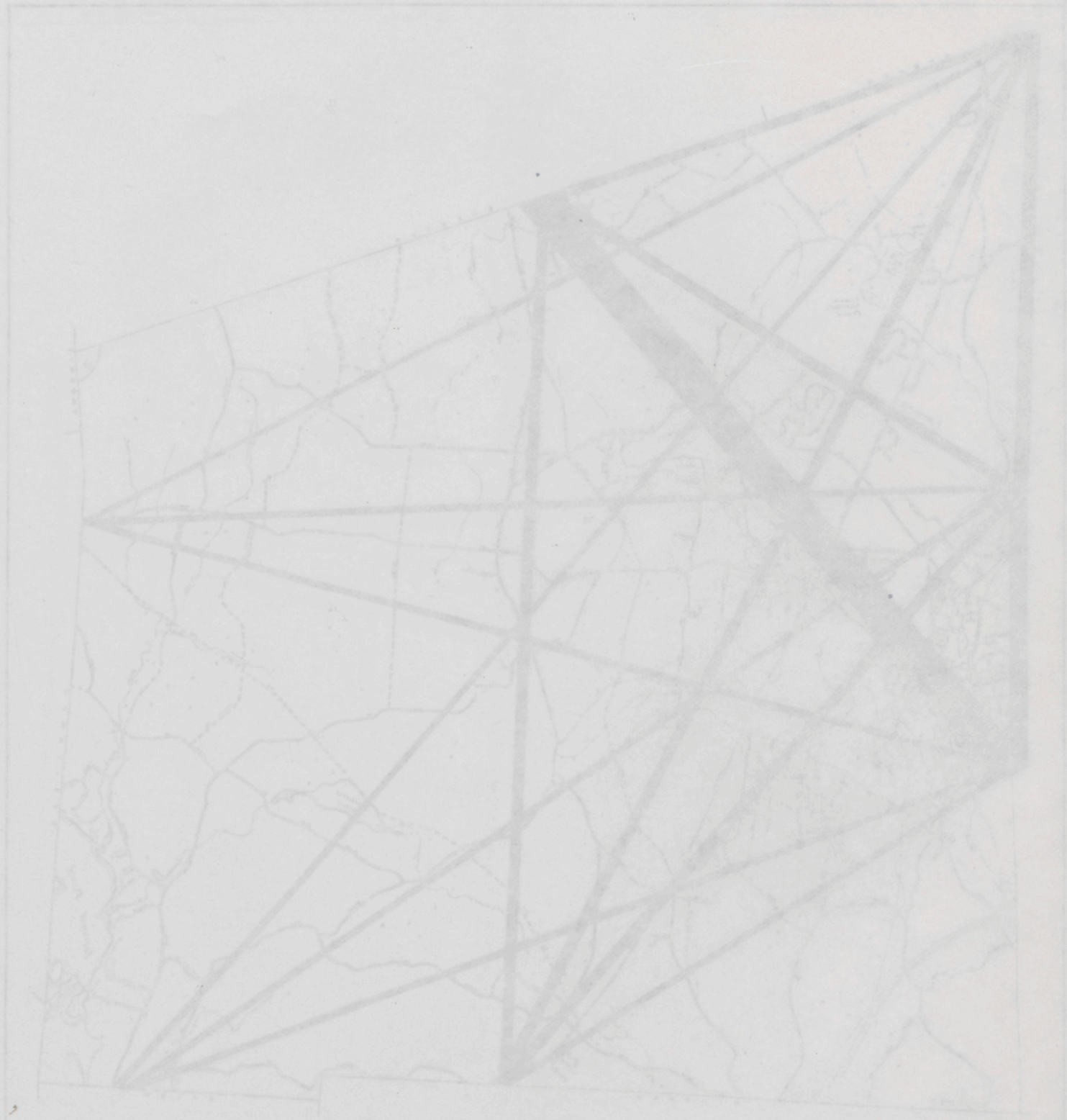
VEHICLE TRIPS

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

Scale:
Miles 1 1/2 0 2000 4000 Feet



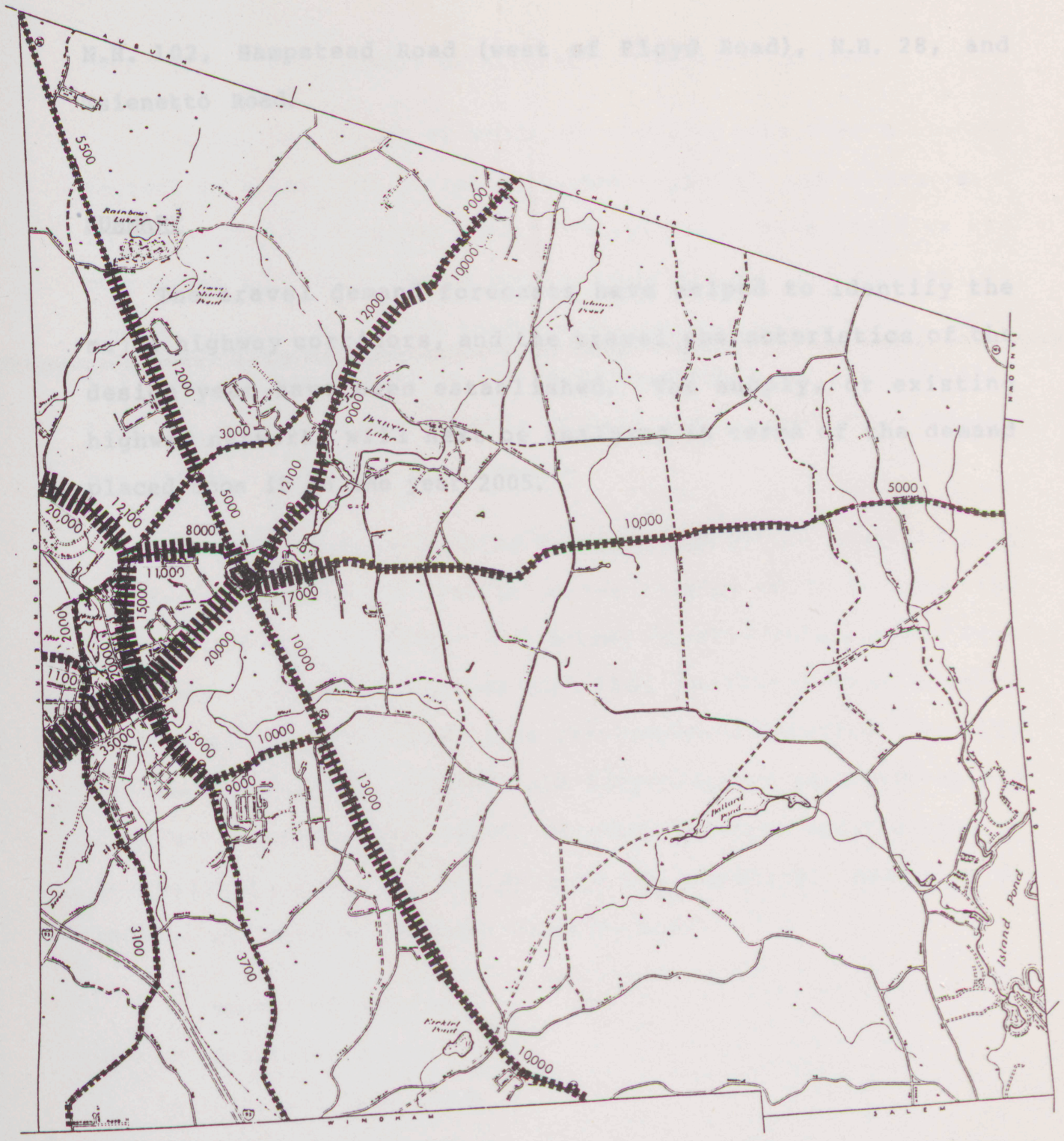
Bypass corridor increases significantly during the projection period as does travel on N.H. 28.

TRAFFIC ASSIGNMENT

The traffic assignment process is the conversion of trips obtained in the trip distribution phase to roadway volumes, or vehicles per day. Distances and speeds on individual links in the highway network are the criteria used to find the quickest routings between each pair of traffic zones, or "minimum time paths". The traffic volumes from the trip tables are then assigned to the path, or series of roadways, representing the quickest route between each zone pair. The assigned trips for 1983 represent actual or estimated ground counts, and adjustments were made to ensure that the assignment was representative of real travel conditions. When adequate adjustments to the base year data were made, the 2005 traffic assignment was done.

The minimum time paths between traffic zones were determined by the computer, and follow the major corridors identified previously. Figure 24 illustrates the average daily traffic volumes (vehicles per day) anticipated in the year 2005, on a townwide basis.

In general, traffic volumes show an increase during the projection period. Most of the significant increases occur west of and including N.H. 28 Bypass, where in most cases, volumes on roadways increase between approximately 25% to 100%. Roadways experiencing significant increases are: N.H. 28 Bypass,



TRAFFIC VOLUMES- 2005

LEGEND

30,000 +
20,000
15,000
10000
5000

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

Scale:
Miles 1 1/2 1 2000 4000 Feet

N.H. 102, Hampstead Road (west of Floyd Road), N.H. 28, and Tsienetto Road.

SUMMARY

The travel demand forecasts have helped to identify the major highway corridors, and the travel characteristics of the design year have been established. The supply, or existing highway network, will next be analyzed in terms of the demand placed upon it in the year 2005.

CHAPTER VI. DEVELOPMENT OF ALTERNATIVE HIGHWAY NETWORKS

The maximum number of vehicles that can pass over a roadway segment in a one hour period is termed capacity, and is expressed in terms of vehicles per hour. Analysis has been based on the comparison of future design hour traffic volumes and theoretical hourly capacity of given roadways as they currently exist. When the ratio of the volume to the capacity exceeds 1.0, it indicates that the roadway is not capable of handling the projected demand, and warrants capacity improvements.

There are two strategies for increasing the capacity on a roadway: 1) reduce the traffic on the roadway or 2) increase the capacity of the facility. The former usually requires new construction, e.g., a bypass or parallel facility, that diverts traffic and attracts trips from the congested facility. Usually associated with this strategy are large capital expenditures and land use impacts. The latter strategy requires modification to the existing facility to increase the capacity. Examples of tactics employed to increase capacity are:

- removal of parking
- additional lanes
- increased lane width
- adding shoulders
- eliminating truck traffic
- conversion to one-way operation

During the analysis, intersection locations in the major corridors were evaluated in terms of their current capacity as compared with design hour volumes for 1983 and the 2005 design year forecasted volumes. In some cases additional lanes are required to accomodate traffic. The 1983 data was used to identify deficiencies in the existing system, while the 2005 volumes were used to determine future deficiencies and the level of improvement needed. The selection of alternative networks to be studied addresses both strategies mentioned previously, those of diverting traffic or increasing capacity on existing facilities.

PROBLEM INTERSECTIONS

The result of traffic flow analysis and high accident location investigation was the identification of problem intersections in Derry. The following is a list of these locations with a brief description of the existing associated problems:

- Crystal Avenue, Birch Street, and N.H. 102: Currently operating at Level of Service "E" (failure or breakdown); need for traffic signal re-phasing; extensive queue lengths on Birch Street approach;

- N.H. 102, Fordway and High Street: Left turns from Fordway experience very long delays;

- Maple Street and N.H. 102: Very long delays for turning vehicles (average of 82 seconds per vehicle) caused by high thru volumes on N.H. 102;

- Londonderry Road and N.H. 102: Turns from Londonderry Road onto N.H. 102 currently experience unacceptable delays during the peak hour;

- Tsienneto Road and N.H. Bypass 28: Turns from Tsienneto northbound onto N.H. Bypass 28 experience average delays in excess of 30 seconds;

- Kendall Pond Road - Fordway Extension: A low volume, four way, unsignalized intersection, not experiencing capacity problems, but having sight distance restrictions; and

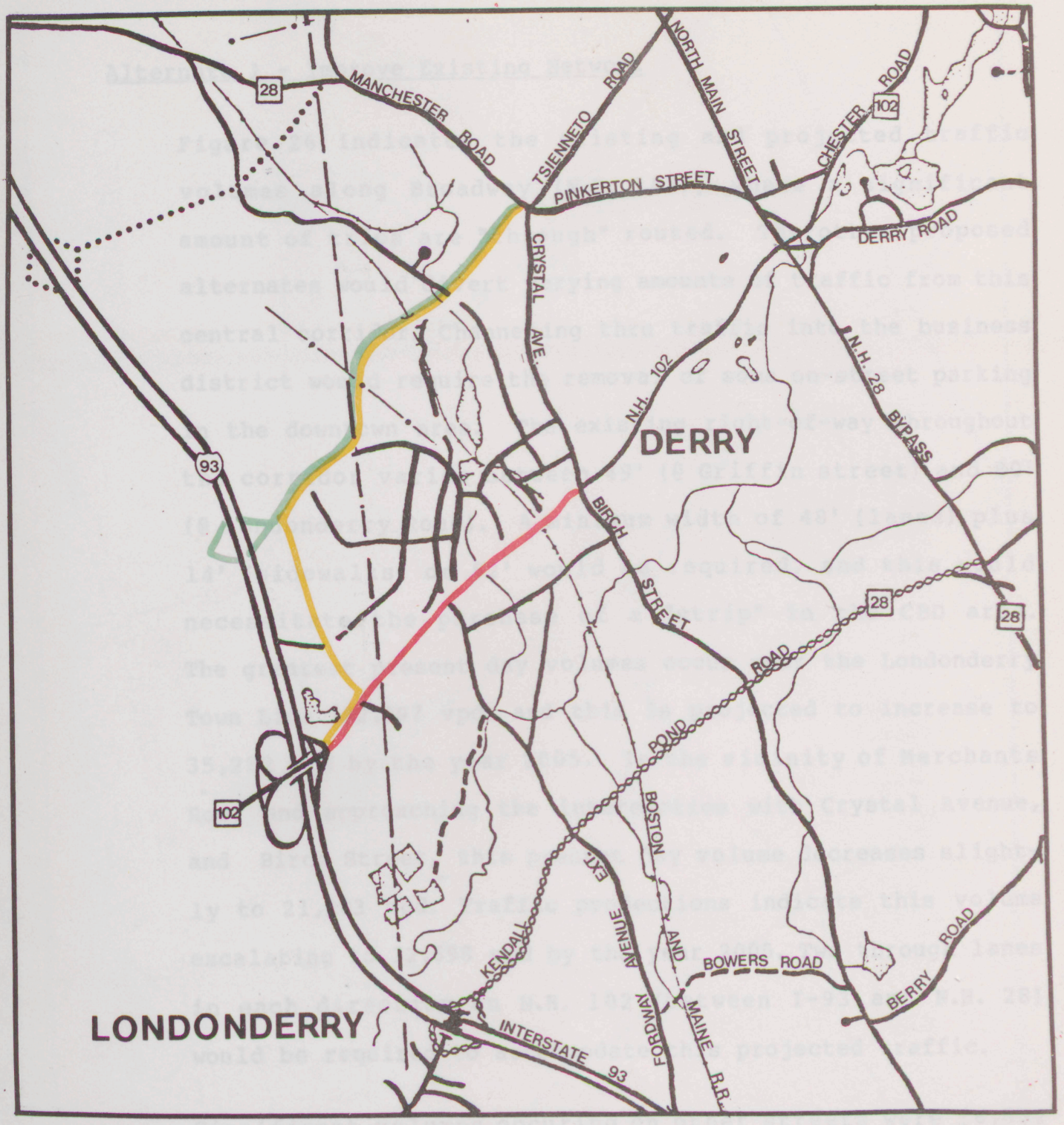
- N.H. Route 28 - Windham Road - Kendall Pond Road: Windham Road intersects N.H. 28 at a point where the State Highway has an abrupt 90° super-elevated turn. A third road (Kendall Pond) intersects Windham Road south of the above intersection, creating a large unchannelized pavement area leading to driver disorientation. This intersection is currently operating at a level of Service "D".

ALTERNATIVE HIGHWAY NETWORKS

A series of five (5) alternates were analyzed in terms of decreasing the traffic on N.H. 102 (Broadway) and/or increasing its capacity at various key intersections. With the exception of Alternate Five, all of the proposed alternates require improvements to intersections and/or I-93 in the adjoining town of Londonderry. Figure 25 indicates the five proposed alternates as studied. Alternate 1, Improve Existing Network, would maintain the current alignment of N.H. 102, increasing the number of travel lanes from 2 to 4 and make certain intersection improvements. The effects on N.H. 102 at its intersection with Crystal Avenue (N.H. 28), Fordway, Maple Street, and Londonderry Road (Londonderry) as well as at the intersection of N.H. Bypass 28 and Tsienneto Road, and Folsom, Tsienneto and N.H. 28, are presented for Alternate 1 (Improve Existing Network), Alternate 2 (Local Bypass) and, Alternate 3 (New Interchange [I-93] at Ash Street). No intersection analysis was performed for alternates 4 and 5, since volumes on the proposed bypass indicated that trip desires were not being served in a direct fashion.

Traffic volumes cited are those resulting from the traffic assignment process.

FIGURE 25



ALTERNATE HIGHWAY NETWORKS - DERRY

LEGEND

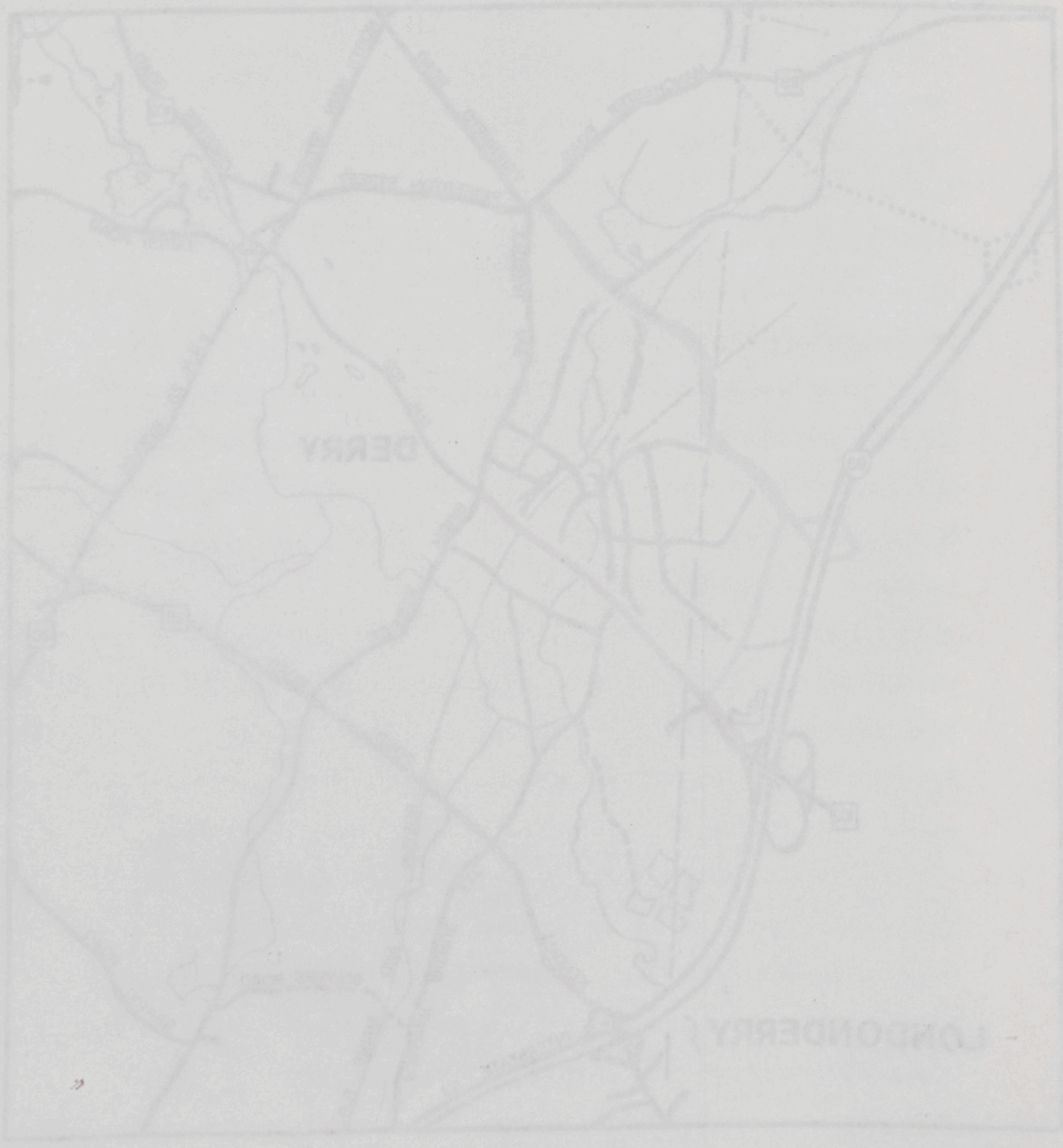
- ALT 1
- ALT 2
- ALT 3
- ALT 4
- ALT 5

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

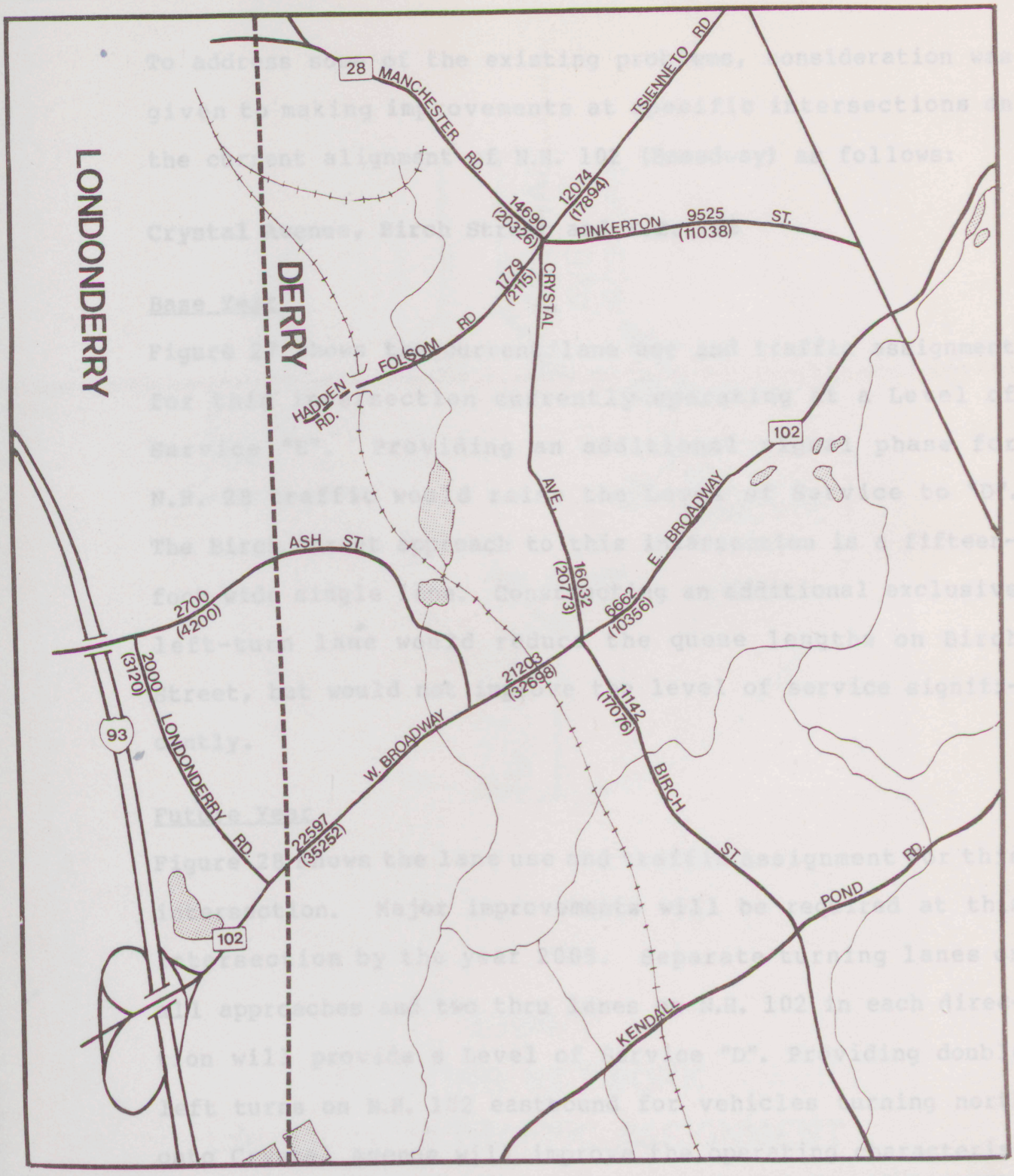
Scale: Miles 0 1/2 1 2000 4000 Feet



Alternate 1 - Improve Existing Network

Figure 26 indicates the existing and projected traffic volumes along Broadway (N.H. 102), where a significant amount of trips are "through" routed. The other proposed alternates would divert varying amounts of traffic from this central corridor. Channeling thru traffic into the business district would require the removal of some on-street parking in the downtown area. The existing right-of-way throughout the corridor varies between 49' (@ Griffin street) and 80' (@ Londonderry Road). A minimum width of 48' (lanes) plus 14' (sidewalks) or 62' would be required, and this would necessitate the purchase of a "strip" in the CBD area. The greatest present day volumes occur near the Londonderry Town Line (22,597 vpd) and this is projected to increase to 35,252 vpd by the year 2005. In the vicinity of Merchants Row, and approaching the intersection with Crystal Avenue, and Birch Street, this present day volume decreases slightly to 21,203 vpd. Traffic projections indicate this volume escalating to 32,698 vpd by the year 2005. Two through lanes in each direction on N.H. 102 (between I-93 and N.H. 28) would be required to accommodate this projected traffic.

Significant volumes occuring on other streets were 16,032 vpd on Crystal Avenue north of N.H. 102, and 14,690 vpd on N.H. 28 (Manchester Road). These are projected to increase to 20,773 vpd and 20,326 vpd respectively by the year 2005.



TRAFFIC ASSIGNMENT - ALTERNATE 1 IMPROVED EXISTING NETWORK

LEGEND

XXX : BASE YEAR

(XXX): FUTURE YEAR

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985


DENVER
LOVELAND

To address some of the existing problems, consideration was given to making improvements at specific intersections on the current alignment of N.H. 102 (Broadway) as follows:

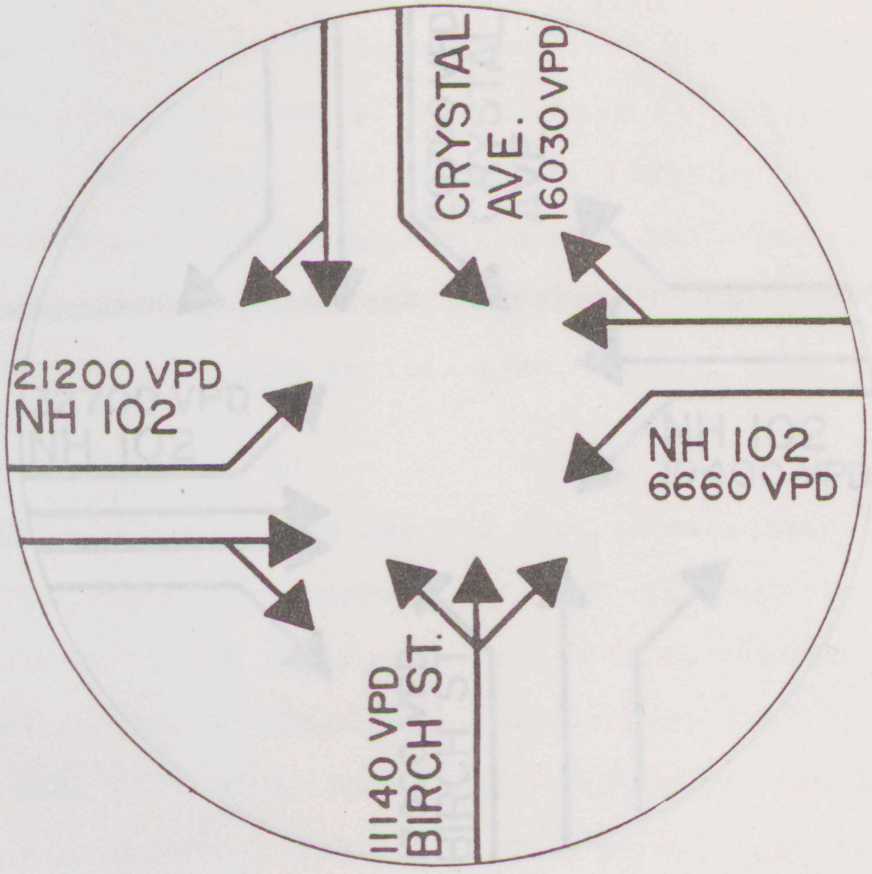
Crystal Avenue, Birch Street and N.H. 102

Base Year

Figure 27 shows the current lane use and traffic assignment for this intersection currently operating at a Level of Service "E". Providing an additional signal phase for N.H. 28 traffic would raise the Level of Service to "D". The Birch Street approach to this intersection is a fifteen-foot wide single lane. Constructing an additional exclusive left-turn lane would reduce the queue lengths on Birch Street, but would not improve the level of service significantly.

Future Year

Figure 28 shows the lane use and traffic assignment for this intersection. Major improvements will be required at this intersection by the year 2005. Separate turning lanes on all approaches and two thru lanes on N.H. 102 in each direction will provide a Level of Service "D". Providing double left turns on N.H. 102 eastbound for vehicles turning north onto Crystal Avenue will improve the operating characteristics to a Level of Service "C".



1984

EXISTING NETWORK

LANE USE & TRAFFIC ASSIGNMENT

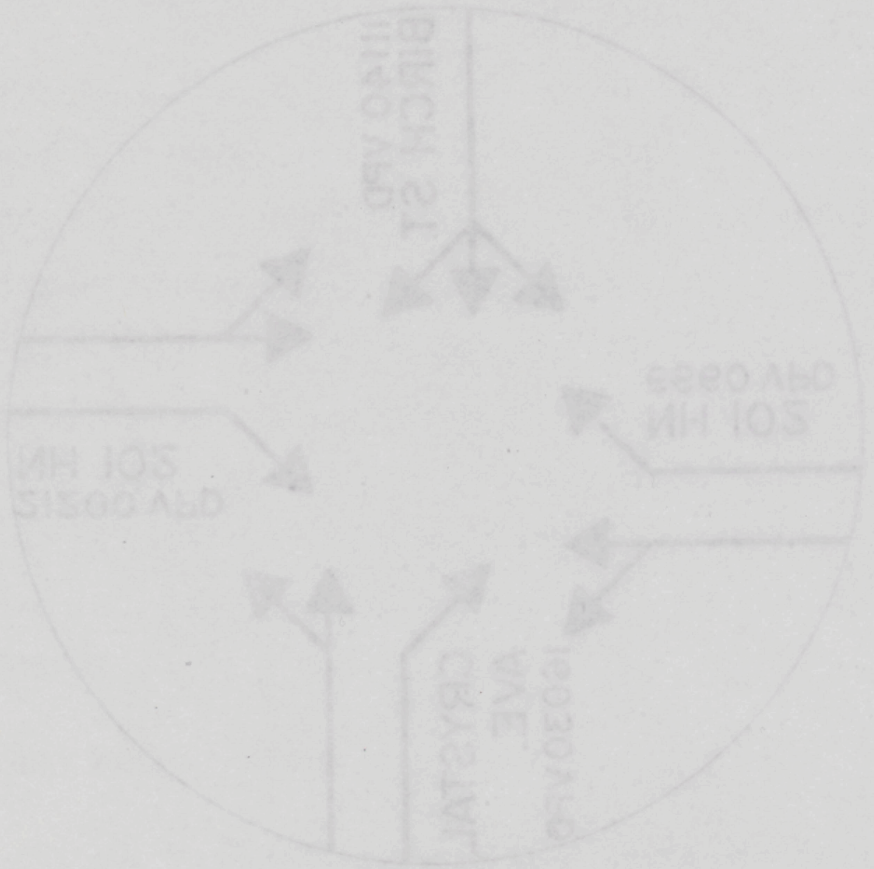
NH 102 and NH 28 - BASE YEAR

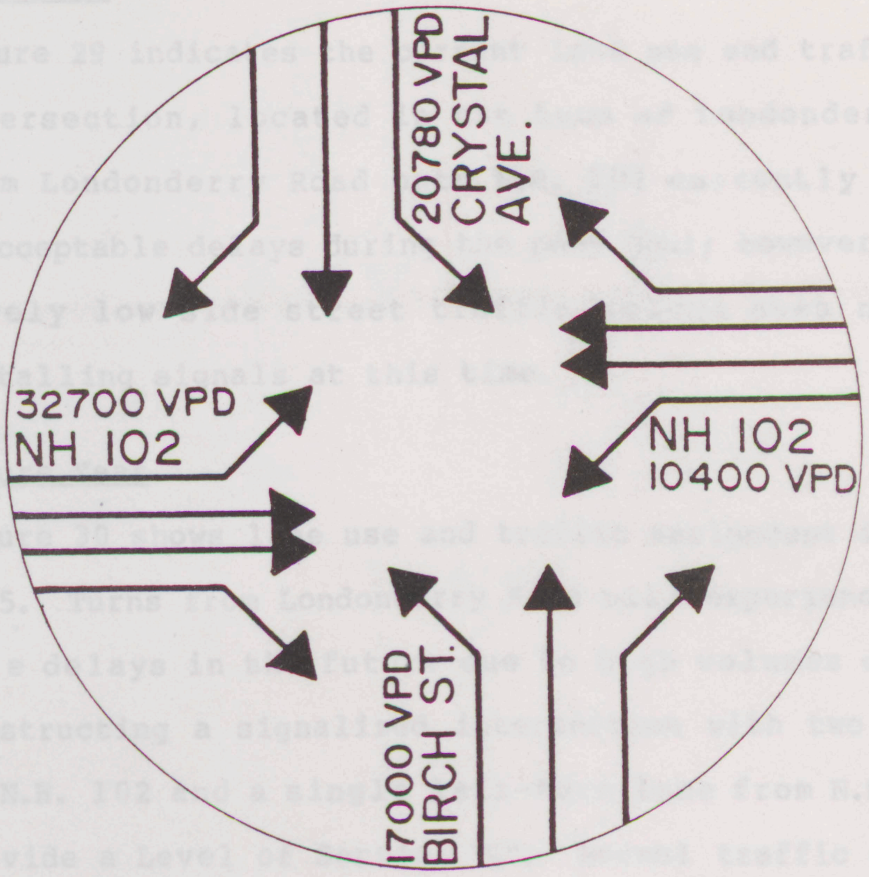
LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985





FUTURE
ALTERNATE I - EXISTING NETWORK
LANE USE & TRAFFIC ASSIGNMENT

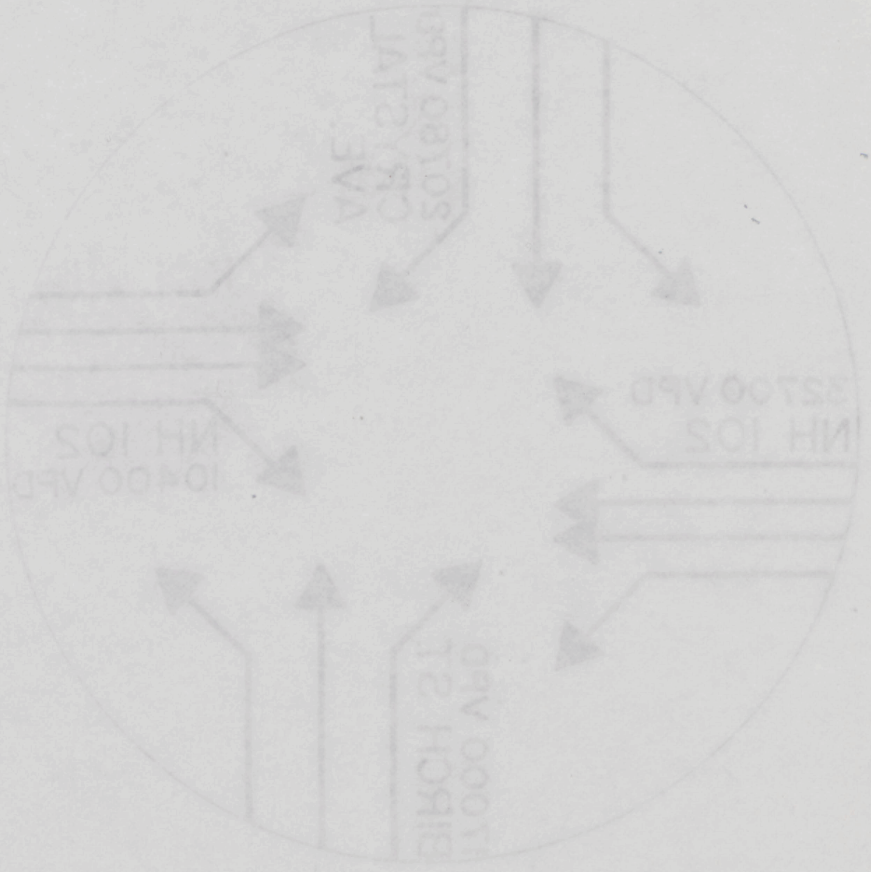
NH 102 and NH 28 - FUTURE YEAR

LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985



Londonderry Road - N.H. 102

Base Year

Figure 29 indicates the current lane use and traffic at this intersection, located in the town of Londonderry. Turns from Londonderry Road onto N.H. 102 currently experience unacceptable delays during the peak hour; however, the relatively low side street traffic volume does not warrant installing signals at this time.

Future Year

Figure 30 shows lane use and traffic assignment for the year 2005. Turns from Londonderry Road will experience unacceptable delays in the future due to high volumes on N.H. 102. Constructing a signalized intersection with two thru lanes on N.H. 102 and a single left-turn lane from N.H. 102 will provide a Level of Service "C". Normal traffic growth will require N.H. 102 to be widened to two thru lanes in each direction and a single left-turn lane by the year 2005. Signals will be required at some point between the base and future years.

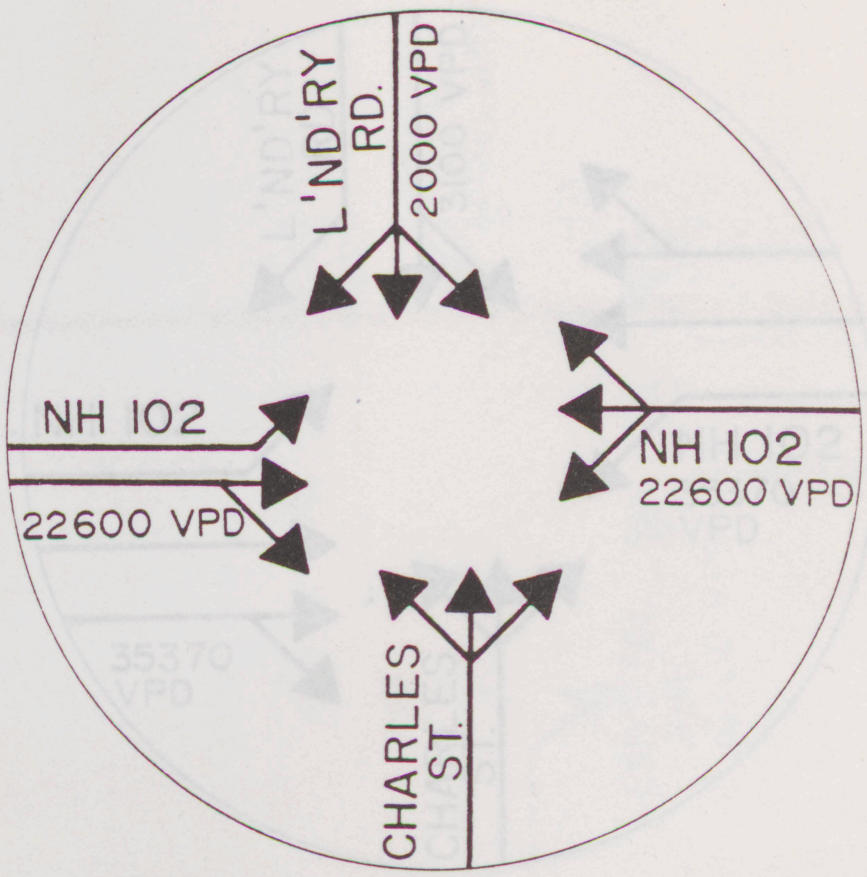
Crystal Avenue (N.H. 28), Folsom Road and Tsienneto Road

Base Year

Figure 31 indicates the current lane use and traffic at this recently reconstructed intersection.

Future Year

Figure 32 shows the required lane use and anticipated traffic in the year 2005. Both N.H. 28 approaches will require



1984
EXISTING NETWORK
LANE USE & TRAFFIC ASSIGNMENT

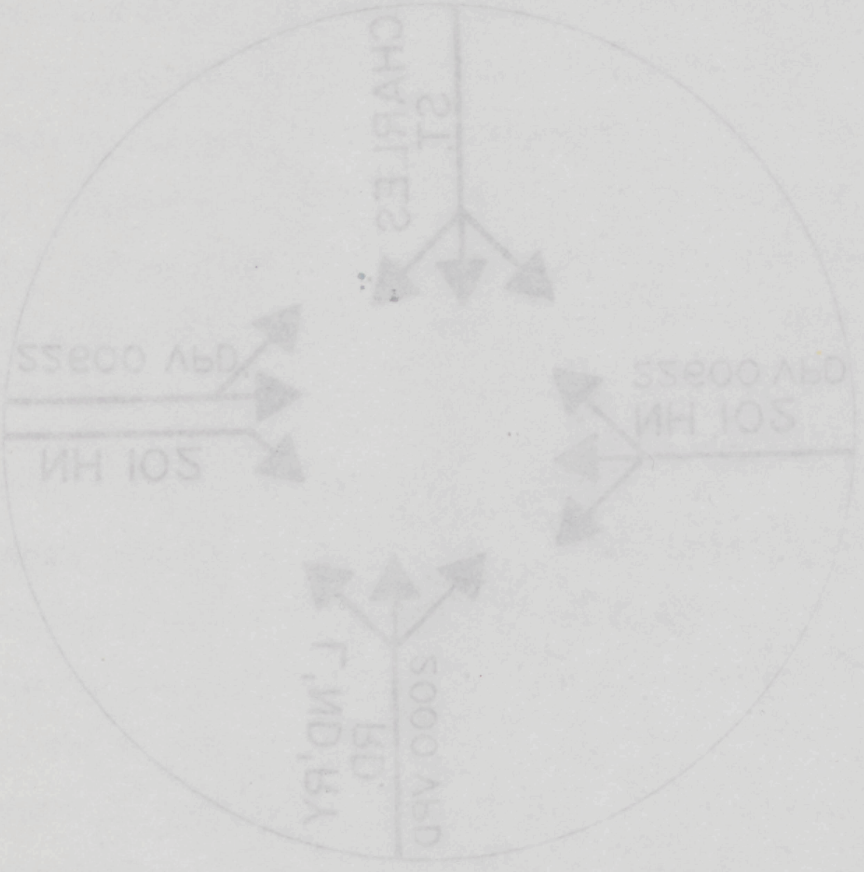
NH 102 and LONDONDERRY RD.- BASE YEAR

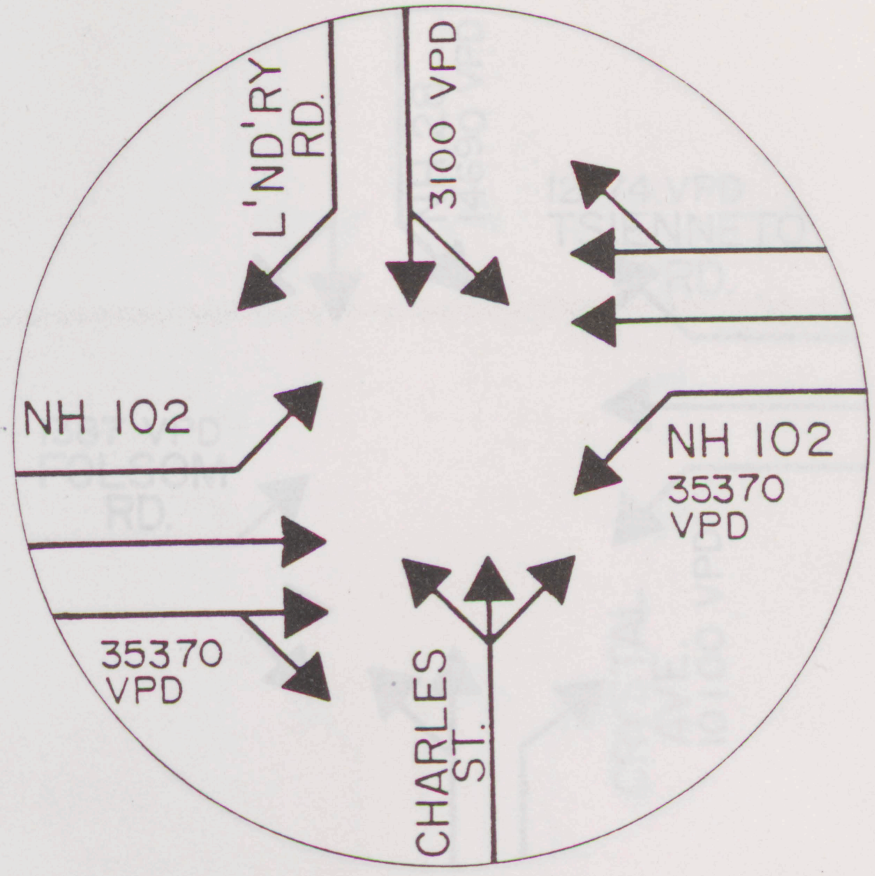
LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985


CHARLES H
SS600 AVD
NH 105
NH 105
SS600 AVD
SS600 AVD
LAND USE



FUTURE

ALTERNATE I - EXISTING NETWORK

LANE USE & TRAFFIC ASSIGNMENT

NH 102 and LONDONDERRY RD. - FUTURE YEAR

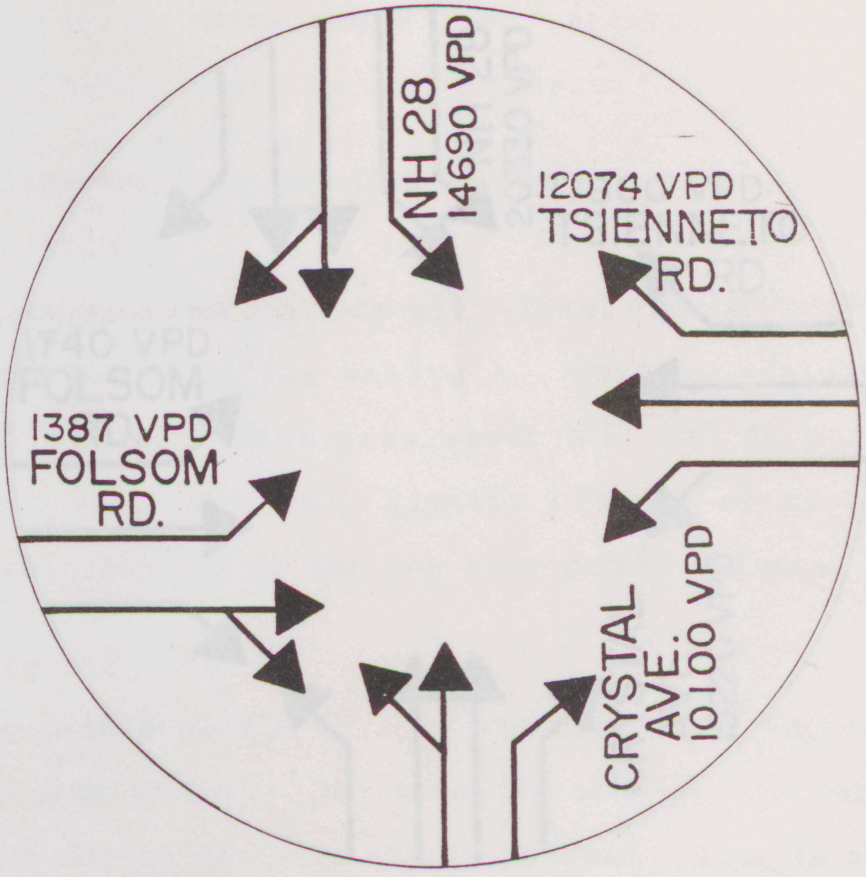
LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985


NH 102
35870
VPD
NH 102
35870
VPD



1984

EXISTING NETWORK

LANE USE & TRAFFIC ASSIGNMENT

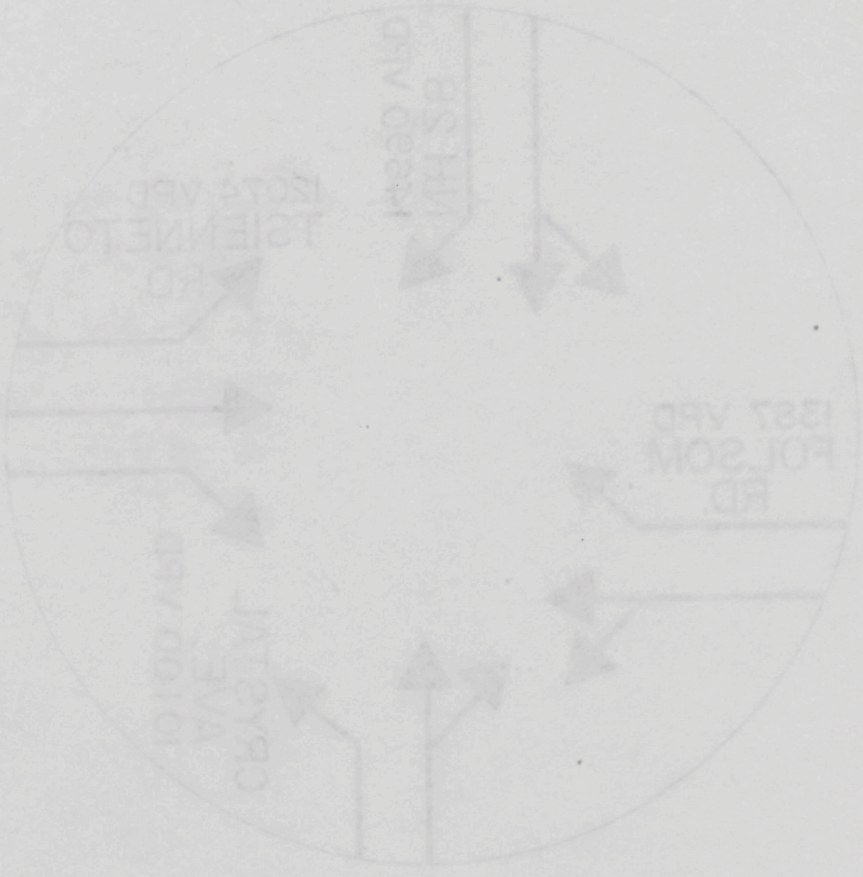
NH 28 and TSIENNETO RD.- BASE YEAR

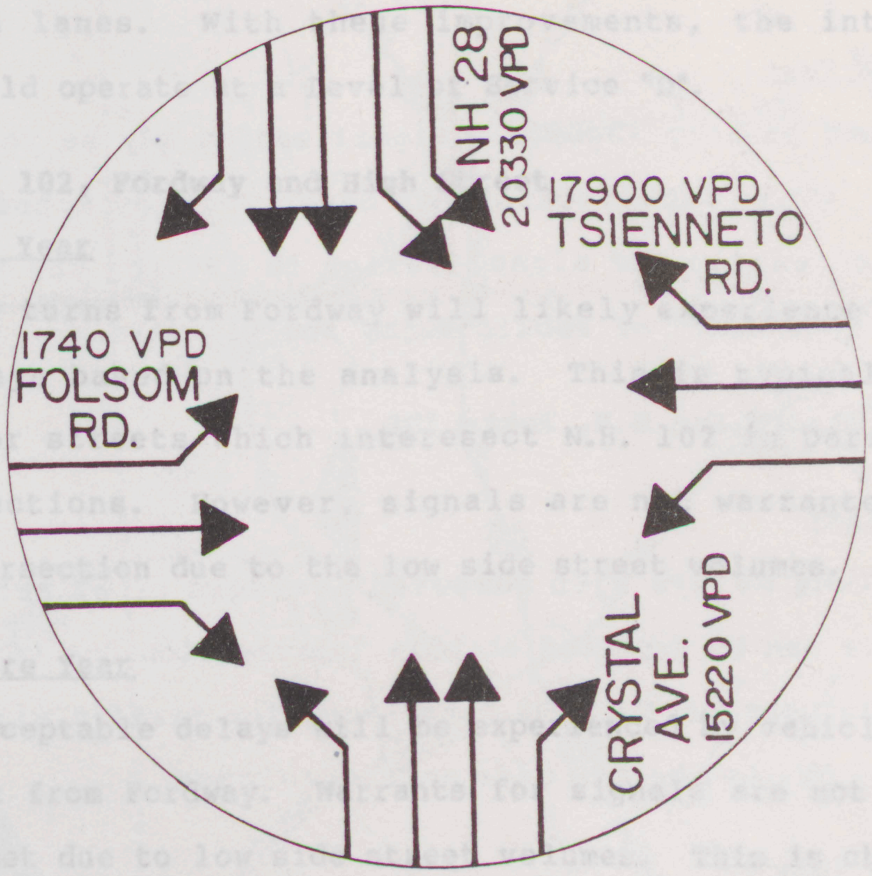
LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985





FUTURE

ALTERNATE I - EXISTING NETWORK

LANE USE & TRAFFIC ASSIGNMENT

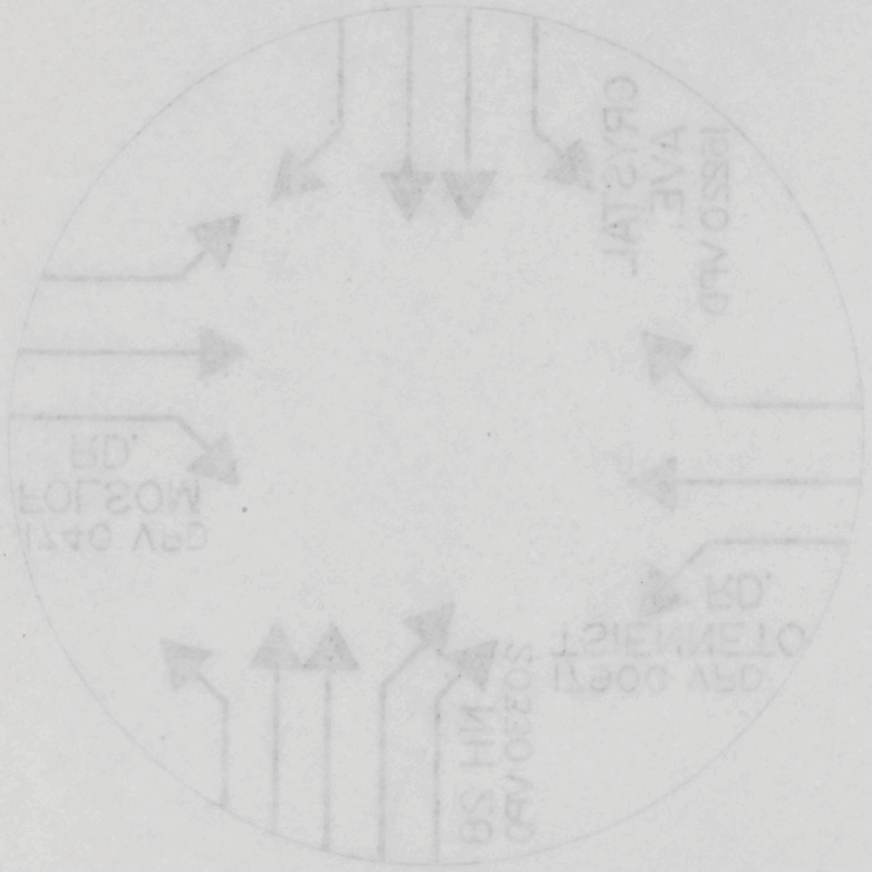
NH 28 and TSIENNETO RD.- FUTURE YEAR

LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985



two through lanes with separate turn lanes. Tsienneto Road and Folsom Road will require one through lane and separate turn lanes. With these improvements, the intersection should operate at a Level of Service "D".

N.H. 102, Fordway and High Street

Base Year

Left turns from Fordway will likely experience very long delays based on the analysis. This is typical of other minor streets which interesect N.H. 102 in Derry in both directions. However, signals are not warranted at this intersection due to the low side street volumes.

Future Year

Unacceptable delays will be experienced by vehicles turning left from Fordway. Warrants for signals are not likely to be met due to low side street volumes. This is characteristic of many of the side streets that intersect with N.H. 102 in the CBD. Reduction of side street delay may be achieved by alternative treatments, such as developing one-way pairs or left turn prohibitions that will reduce the frequency of interruption to N.H. 102 traffic while condensing side street traffic to intersections which may warrant signalization.

Tsienneto Road - N.H. 28 Bypass

Base Year

Turns from Tsienneto northbound onto N.H. 28 Bypass will experience average delays in excess of thirty seconds.

Providing a separate turn lane will reduce the average delays to approximately thirteen seconds.

Future Year

Separate turning lanes and signalization may be required by 2005. (This intersection has been recently scheduled for reconstruction and signalization in 1987 by the New Hampshire Department of Public Works and Highways.

Maple Street and N.H. Route 102

Base Year

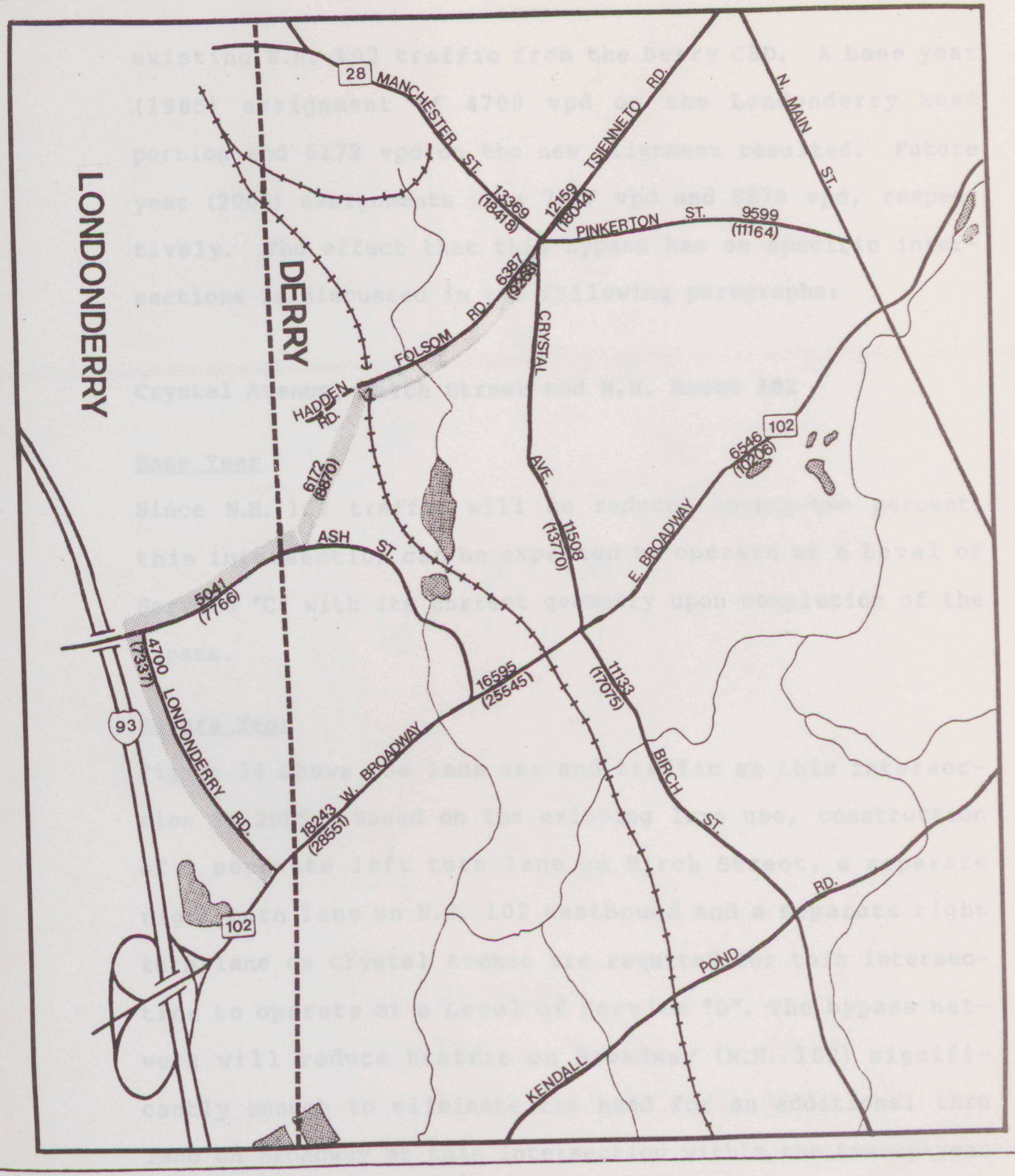
Very long delays with computed averages of 82 seconds per vehicle can be expected at this intersection due to the high thru volumes on N.H. 102. Warrants for traffic signals are not met due to the low side street volumes.

Future Year

If no improvements are made to the network in the future, a failed condition will exist for left turns from Maple Street eastbound onto N.H. 102. Relatively low traffic volumes do not indicate that signals will be warranted, but left turn restriction will probably be required.

Alternate 2 - Local Bypass

Figure 33 indicates the proposed alignment for this alternate, consisting of Londonderry Road, Ash Street and and a new road constructed on a new alignment between Ash Street (@ the Londonderry/Derry Town Line) and Folsom Road. This bypass can be expected to divert approximately 22% of the



TRAFFIC ASSIGNMENT - ALTERNATE 2 LOCAL BYPASS

LEGEND

XXX : BASE YEAR

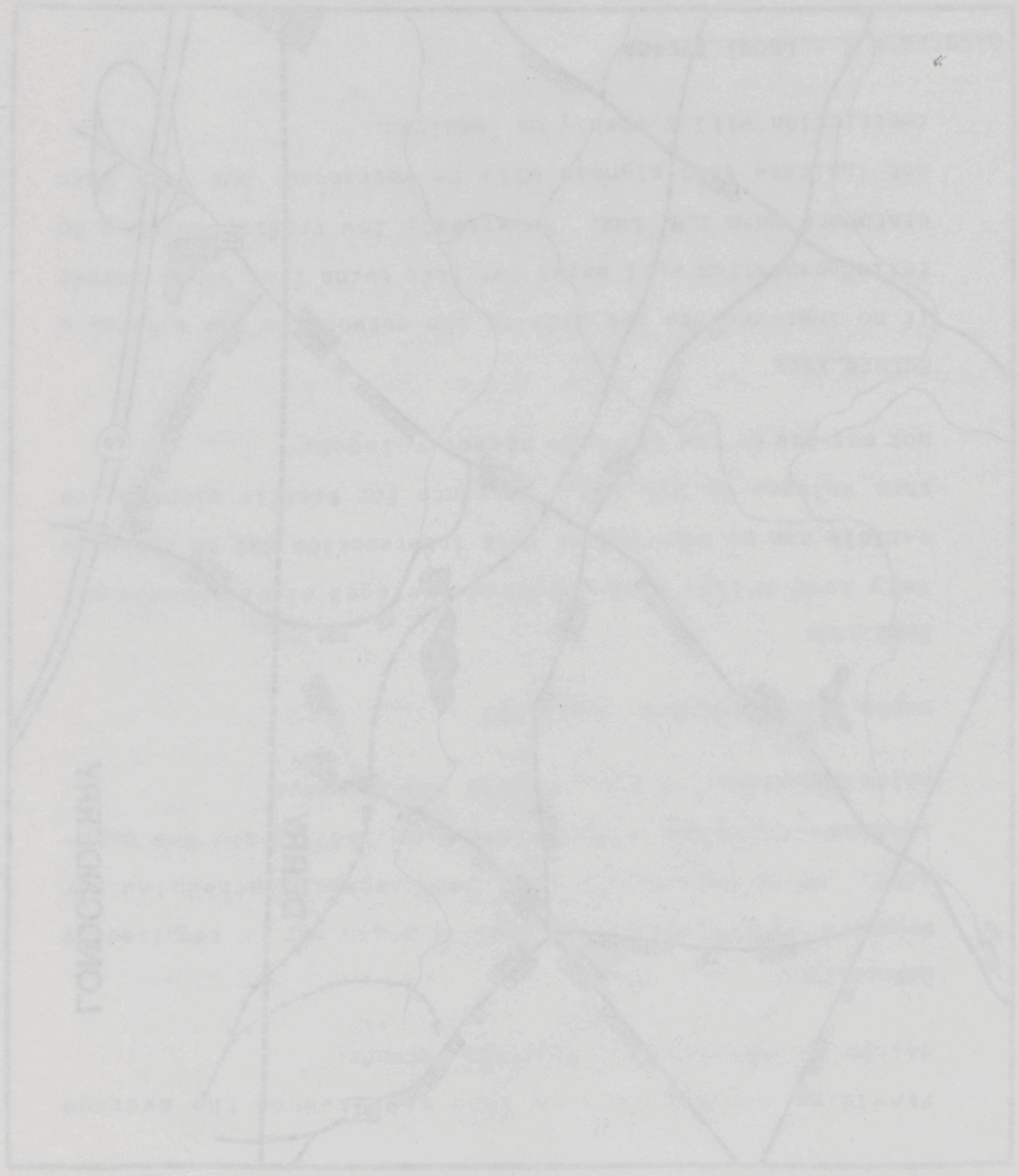
(XXX) : FUTURE YEAR

▨ : PROPOSED BYPASS

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985



existing N.H. 102 traffic from the Derry CBD. A base year (1985) assignment of 4700 vpd on the Londonderry Road portion and 6172 vpd on the new alignment resulted. Future year (2005) assignments were 7337 vpd and 8870 vpd, respectively. The effect that this bypass has on specific intersections is discussed in the following paragraphs:

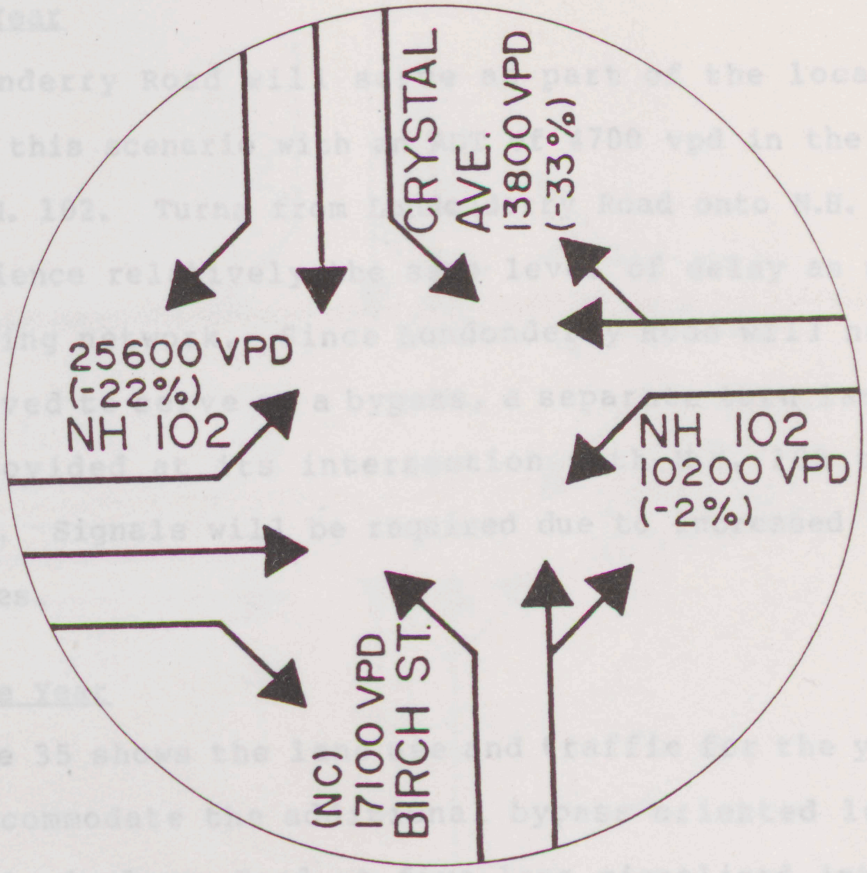
Crystal Avenue, Birch Street and N.H. Route 102

Base Year

Since N.H. 102 traffic will be reduced twenty-two percent, this intersection can be expected to operate at a Level of Service "C" with its current geometry upon completion of the bypass.

Future Year

Figure 34 shows the lane use and traffic at this intersection in 2005. Based on the existing lane use, construction of a separate left turn lane on Birch Street, a separate right turn lane on N.H. 102 eastbound and a separate right turn lane on Crystal Avenue are required for this intersection to operate at a Level of Service "D". The bypass network will reduce traffic on Broadway (N.H. 102) significantly enough to eliminate the need for an additional thru lane on Broadway at this intersection within the twenty-year design period. Separate turn lanes, as discussed above, will still be required.



FUTURE
WITH ALTERNATE 2 - LOCAL BYPASS
LANE USE & TRAFFIC ASSIGNMENT

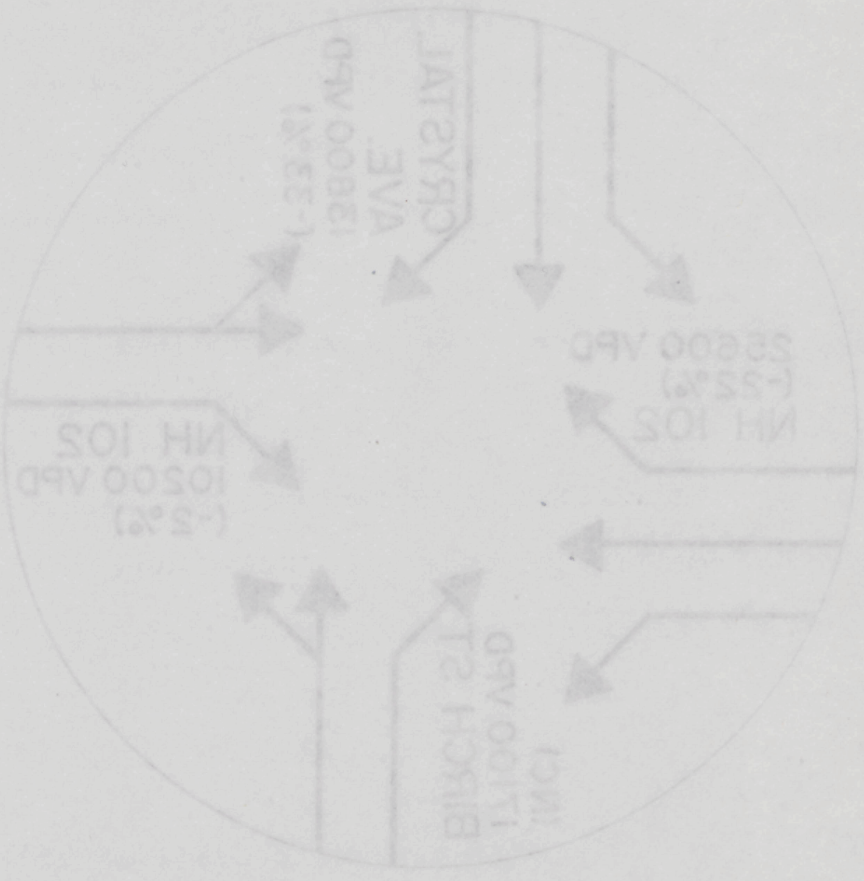
NH 102 and NH 28 - FUTURE YEAR

LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985


CRYSTAL AVE
(800 VPD)
(-23%)
25500 VPD
(-22%)
NH 102
NH 102
10200 VPD
(-2%)
(-2%)
BYPASS
(-2%)

Londonderry Road/N.H. 102

Base Year

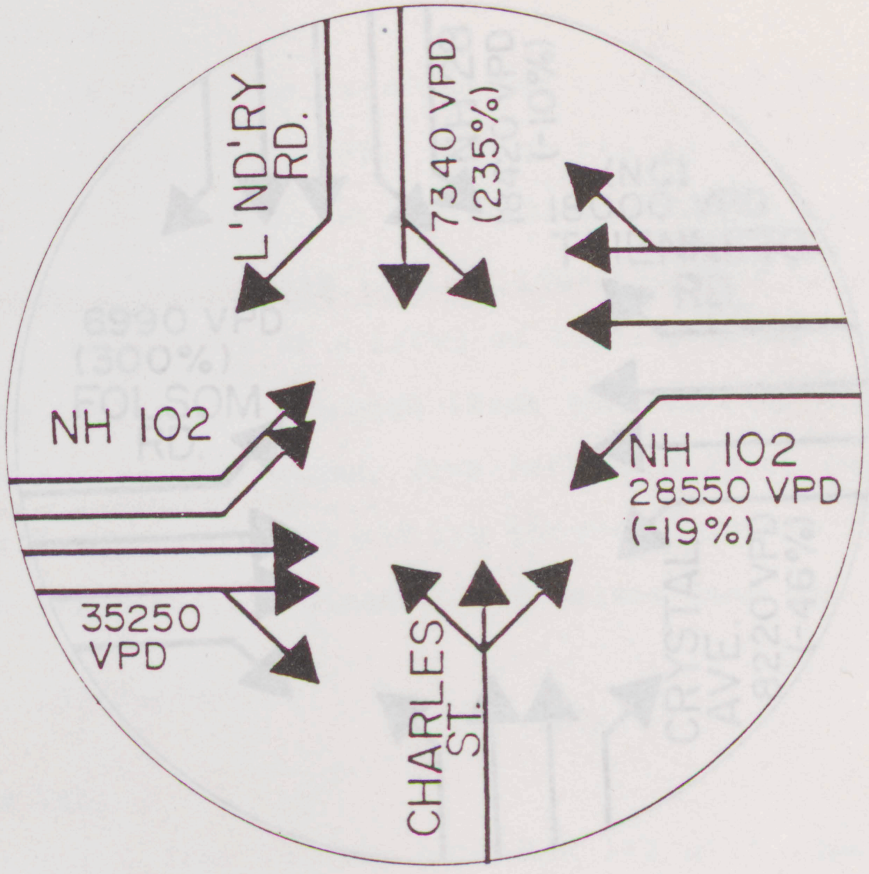
Londonderry Road will serve as part of the local bypass under this scenario with an ADT of 4700 vpd in the vicinity of N.H. 102. Turns from Londonderry Road onto N.H. 102 will experience relatively the same level of delay as under the existing network. Since Londonderry Road will need to be improved to serve as a bypass, a separate turn lane should be provided at its intersection with N.H. 102 to reduce delay. Signals will be required due to increased left turn volumes.

Future Year

Figure 35 shows the lane use and traffic for the year 2005. To accommodate the additional bypass oriented left turns onto Londonderry Road, a five-lane signalized intersection with double left turn lanes on the eastbound N.H. Route 102 approach will be required to obtain a Level of Service "C".

Summary

For the local bypass network, separate turn lanes on Londonderry Road and a separate left turn lane on N.H. 102 will be required to serve the base year. By the year 2005, two thru lanes on N.H. 102 and two left-turn lanes from the eastbound approach may be required.



FUTURE
WITH ALTERNATE 2 - LOCAL BYPASS
LANE USE & TRAFFIC ASSIGNMENT

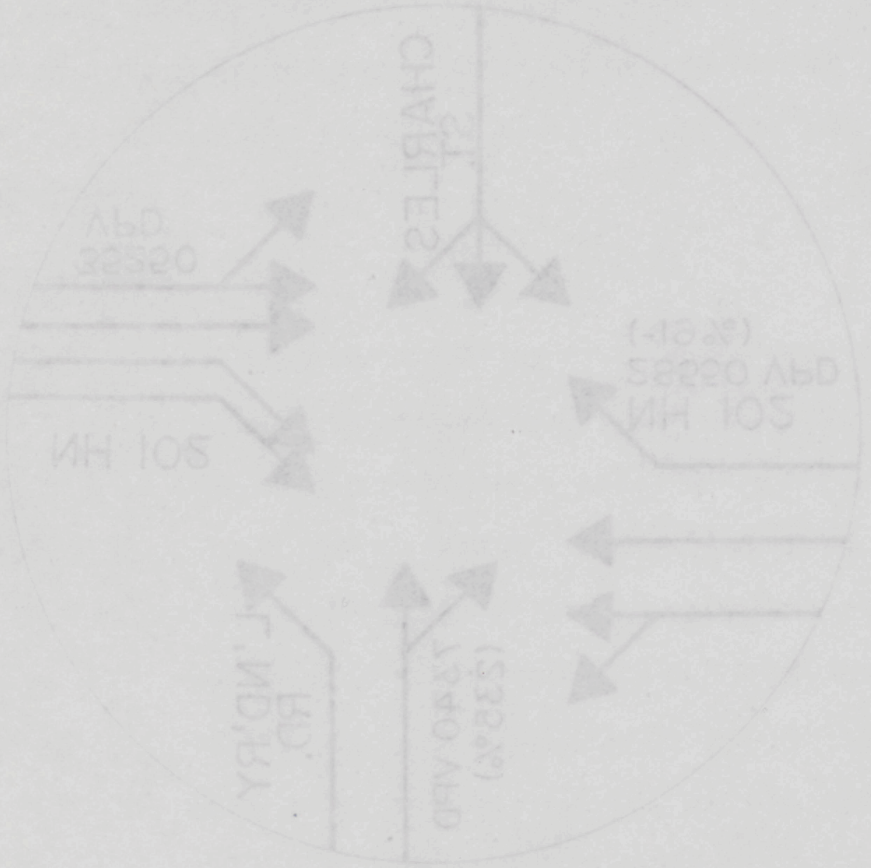
NH 102 and LONDONDERRY RD. - FUTURE YEAR

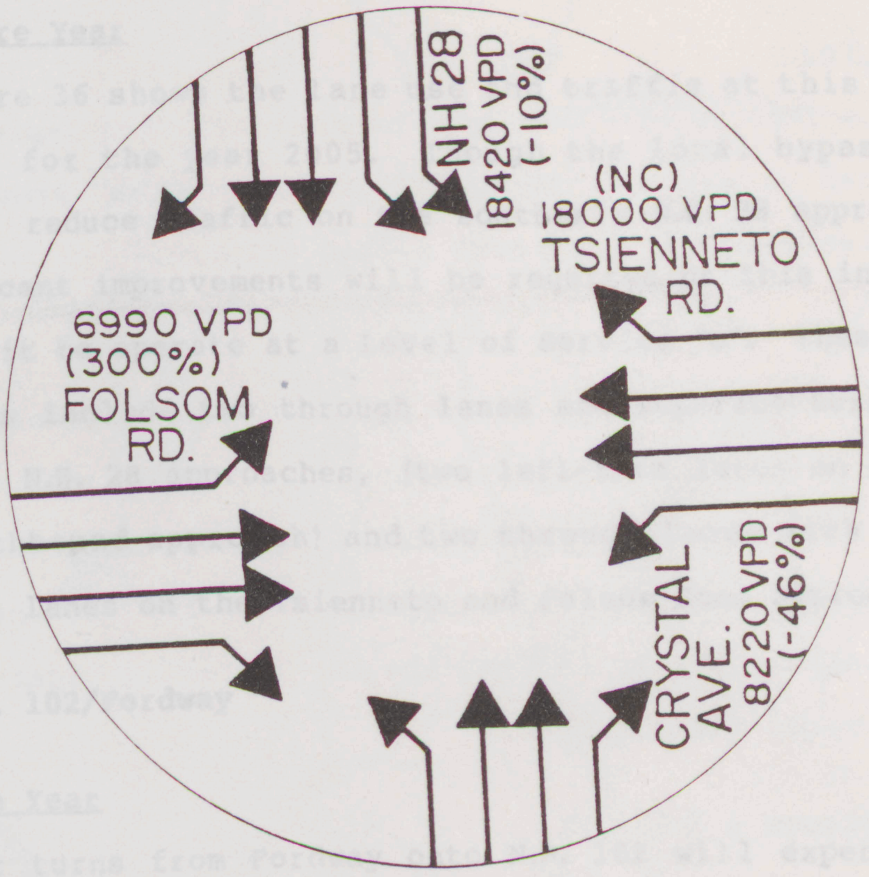
LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985


CHARLES ST.
NH 105
SEASIDE AVE.
(ONE WAY)
SEASIDE AVE.
NH 105



FUTURE
WITH ALTERNATE 2 - LOCAL BYPASS
LANE USE & TRAFFIC ASSIGNMENT

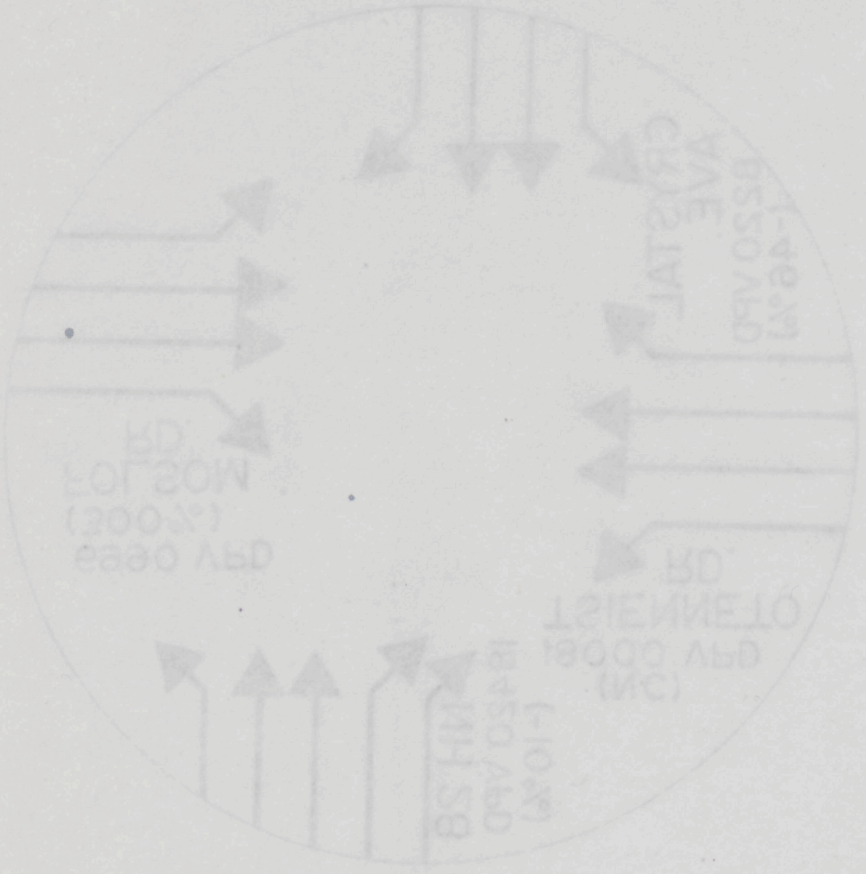
NH 28 and TSIENNETO RD. - FUTURE YEAR

LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985



Crystal Avenue, Folsom Road, Tsienneto Road

Future Year

Figure 36 shows the lane use and traffic at this intersection for the year 2005. Though the local bypass network will reduce traffic on the southerly N.H. 28 approach, significant improvements will be required at this intersection for it to operate at a Level of Service "D". These improvements include two through lanes and separate turn lanes on both N.H. 28 approaches, (two left-turn lanes on the N.H. 28 southbound approach) and two through lanes with exclusive turn lanes on the Tsienneto and Folsom Road approaches.

N.H. 102/Fordway

Base Year

Left turns from Fordway onto N.H. 102 will experience less delay under this scenario. The average delay is 51 seconds due to the decrease in the N.H. 102 traffic. Again, signals are not warranted due to low side street volumes.

Future Year

The same operating characteristics previously discussed with the existing network scenario will be experienced.

Tsienneto Road/N.H. Bypass 28

Base Year

No impacts would be realized at this intersection due to construction of a bypass at Londonderry Road. Therefore,

the improvements discussed as part of "Improve Existing Network" should be implemented for the local bypass.

Future Year

Since no impacts are likely to be realized, the improvements discussed as part of "Improve Existing Network" should also be implemented for the local bypass network.

Summary

The eastbound Tsienneto Road approach should be widened to accommodate a separate left-turn lane. This intersection should be monitored with respect to signal warrants. (This intersection has been recently scheduled for reconstruction and signalization in 1987 by the New Hampshire Department of Public Works and Highways.

Maple Street & N.H. 102

Base Year

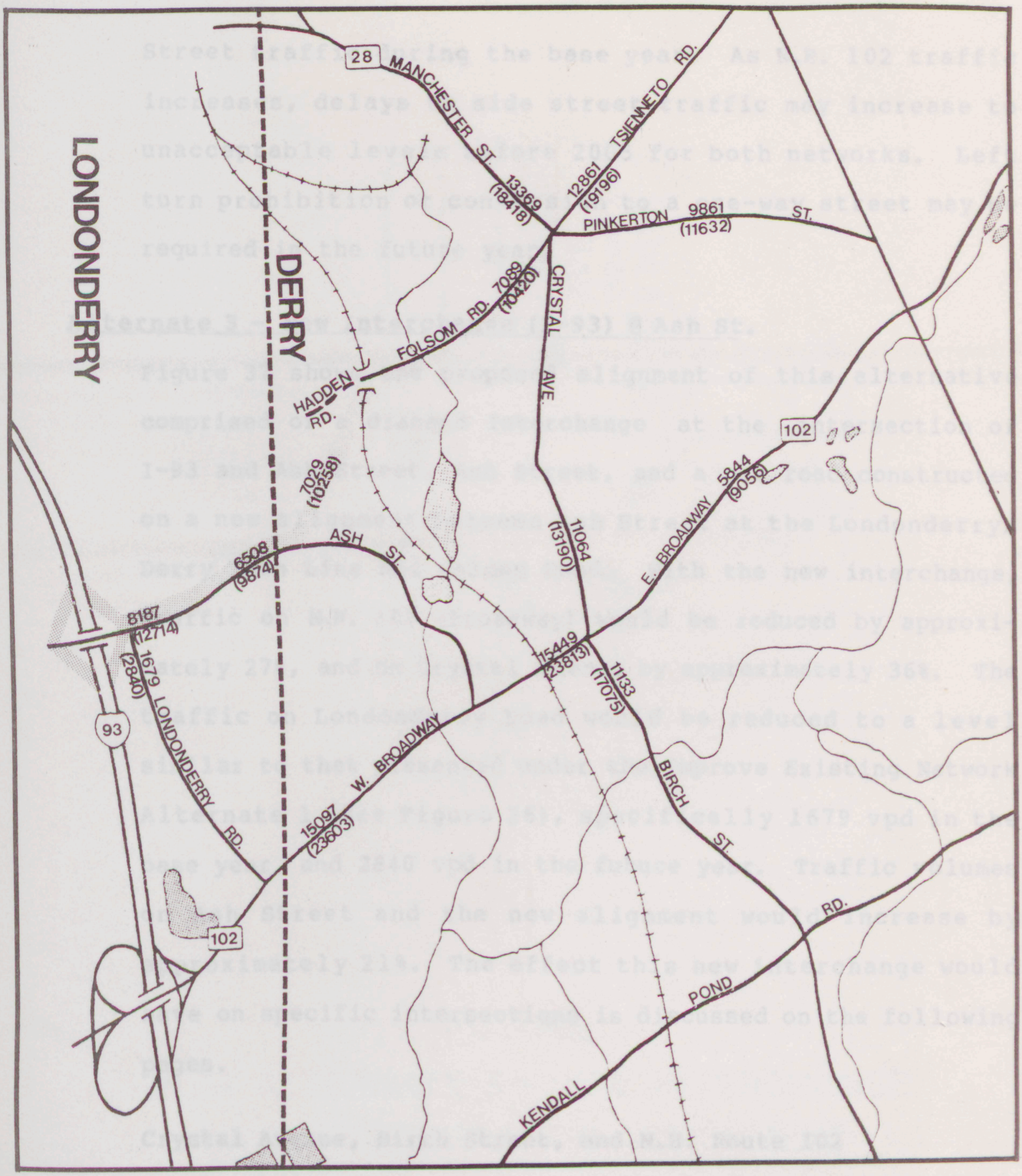
Delays to left turning vehicles from Maple Street will be reduced to acceptable levels under this network, or from an average of 82 seconds down to 32 seconds.

Future Year

Delays will be reduced to left turning vehicles but not to acceptable levels under this scenario. Left turn restrictions will probably be required.

Summary

The local bypass network will reduce N.H. 102 traffic volumes significantly to allow acceptable delays to Maple



TRAFFIC ASSIGNMENT - ALTERNATE 3 NEW INTERCHANGE (I-93) at ASH STREET

LEGEND

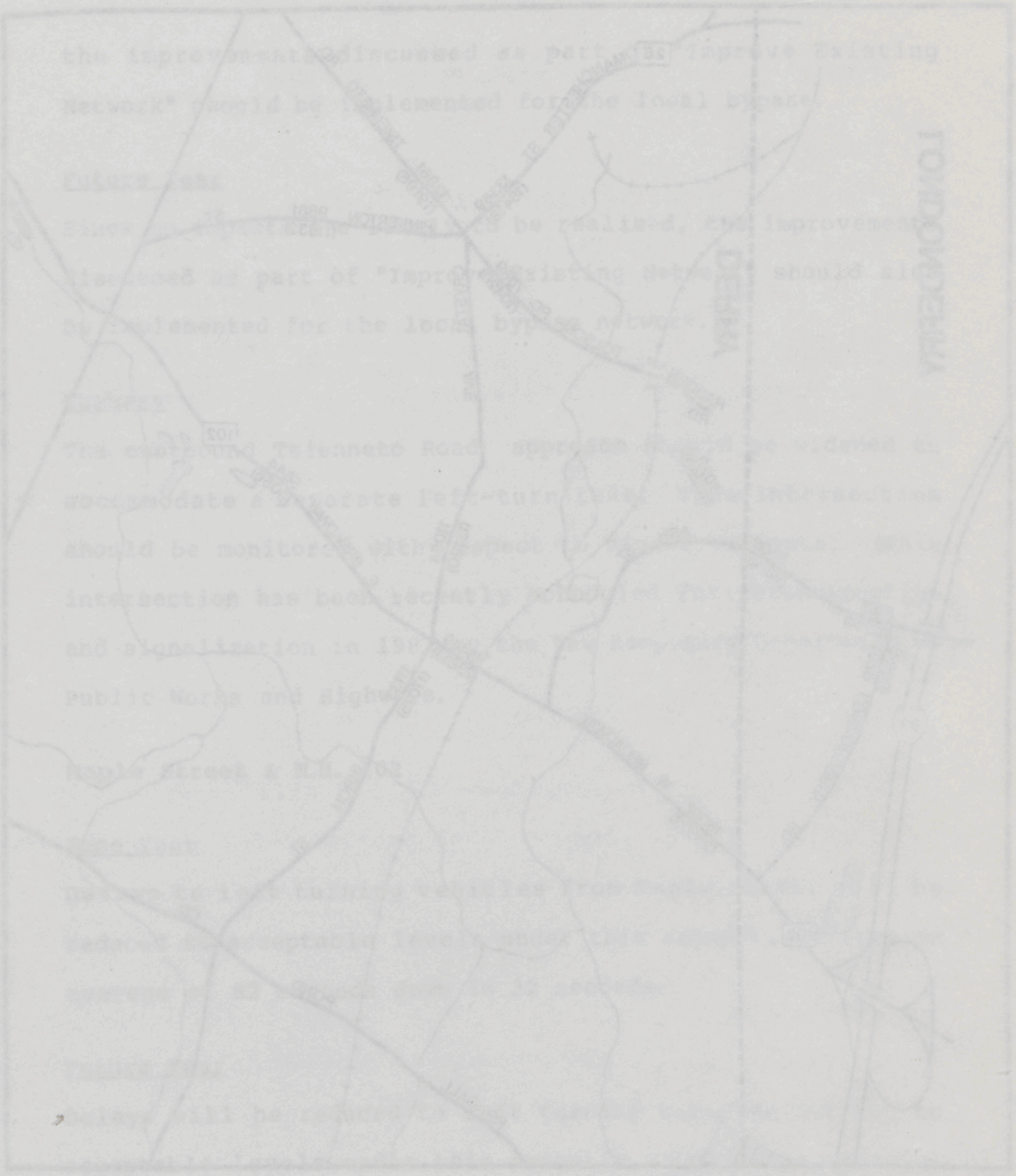
XXX: BASE YEAR

(XXX): FUTURE YEAR

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985



Street traffic during the base year. As N.H. 102 traffic increases, delays to side street traffic may increase to unacceptable levels before 2005 for both networks. Left turn prohibition or conversion to a one-way street may be required in the future year.

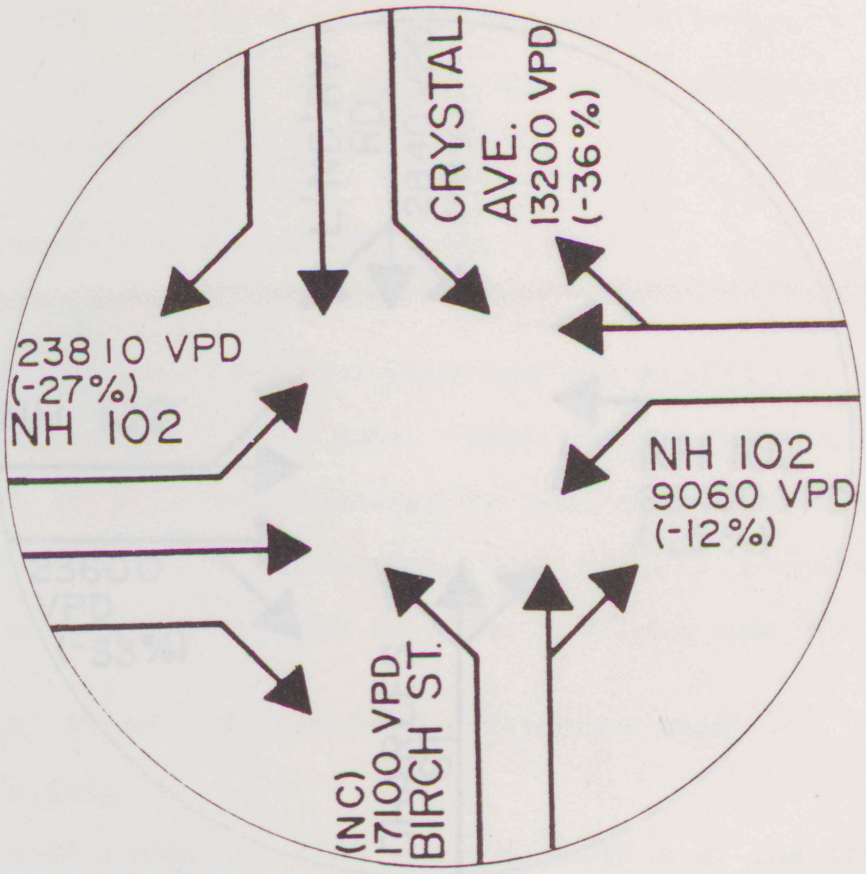
Alternate 3 - New Interchange (I-93) @ Ash St.

Figure 37 shows the proposed alignment of this alternative comprised of a diamond interchange at the intersection of I-93 and Ash Street, Ash Street, and a new road constructed on a new alignment between Ash Street at the Londonderry/ Derry Town Line and Folsom Road. With the new interchange, traffic on N.H. 102 (Broadway) would be reduced by approximately 27%, and on Crystal Avenue by approximately 36%. The traffic on Londonderry Road would be reduced to a level similar to that presented under the Improve Existing Network Alternate 1 (See Figure 26), specifically 1679 vpd in the base year, and 2840 vpd in the future year. Traffic volumes on Ash Street and the new alignment would increase by approximately 21%. The effect this new interchange would have on specific intersections is discussed on the following pages.

Crystal Avenue, Birch Street, and N.H. Route 102

Future Year

Figure 38 shows the lane use and traffic at this intersection. Though constructing an interchange will reduce traffic volumes at this intersection greater than the local bypass alternate, similar roadway improvements may be



FUTURE

WITH ALTERNATE 3 - NEW INTERCHANGE

LANE USE & TRAFFIC ASSIGNMENT

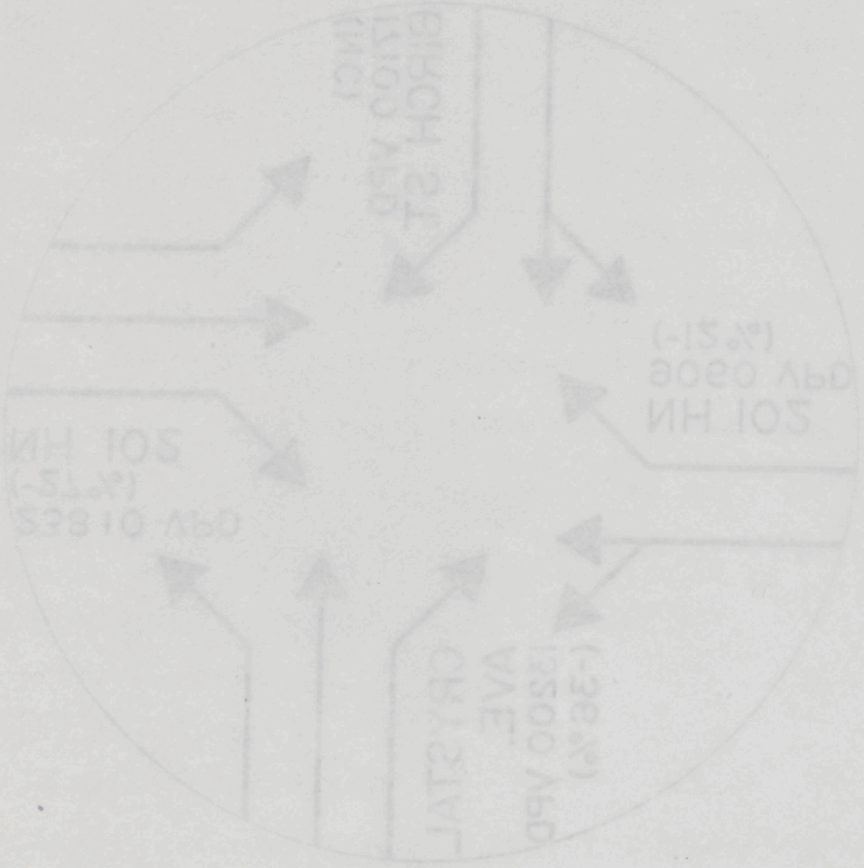
NH 102 and NH 28 - FUTURE YEAR

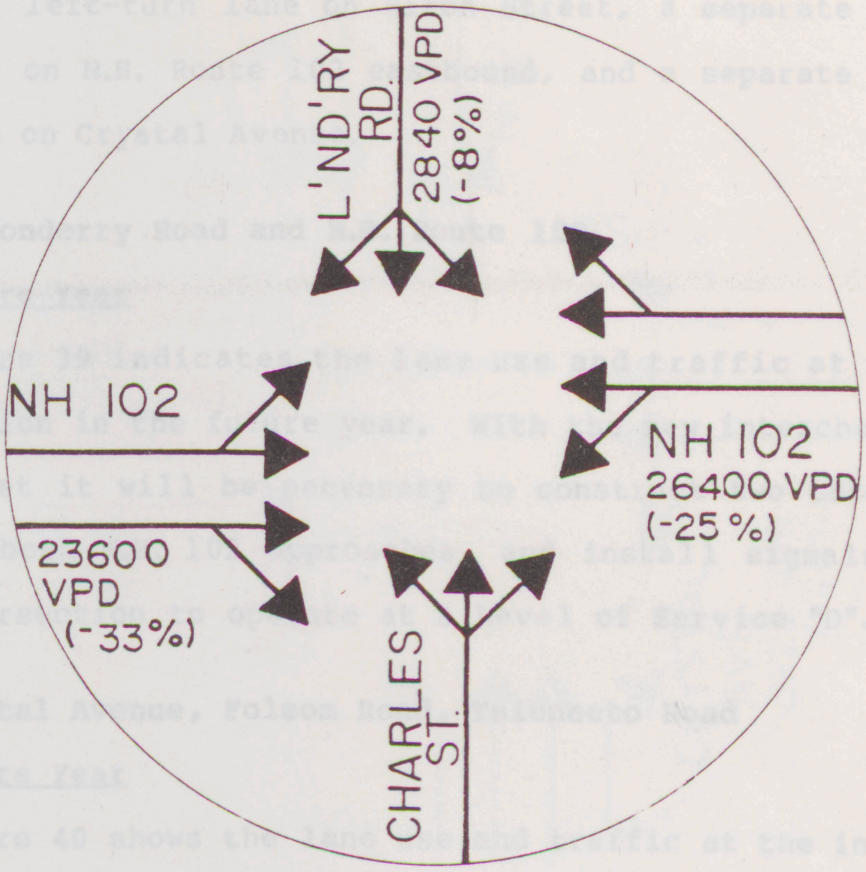
LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985





FUTURE
WITH ALTERNATE 3 - NEW INTERCHANGE
LANE USE & TRAFFIC ASSIGNMENT

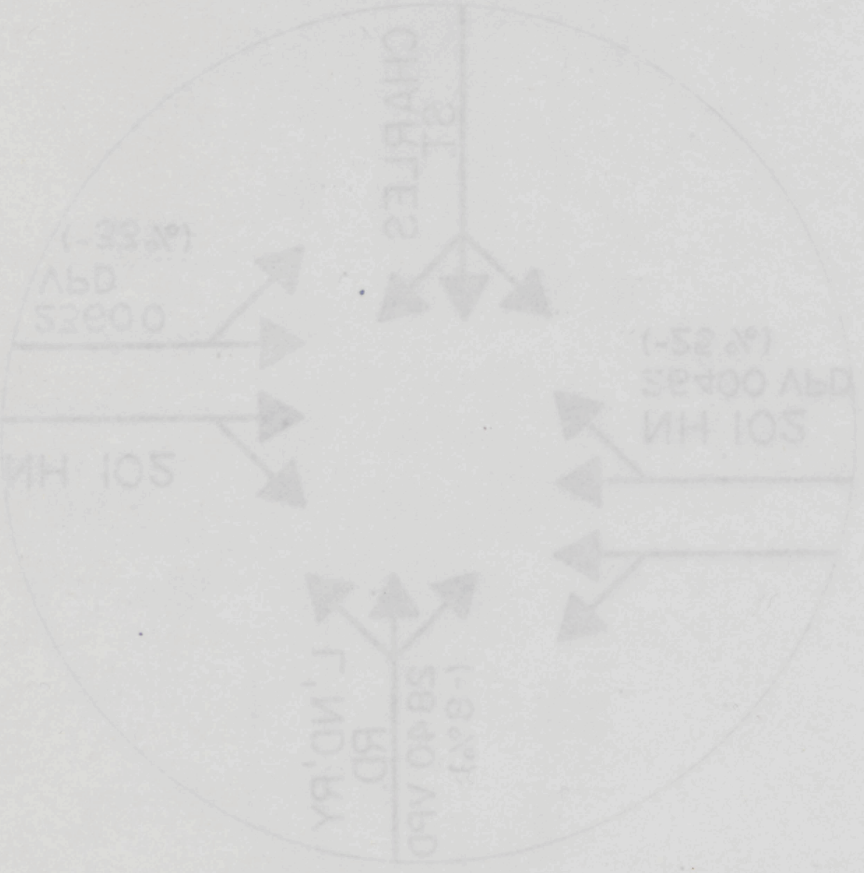
NH 102 and LONDONDERRY RD. - FUTURE YEAR

LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985



required in the future. For this intesection to operate at a level of Service "D", these improvements include a separate left-turn lane on Birch Street, a separate right-turn lane on N.H. Route 102 eastbound, and a separate right-turn lane on Crystal Avenue.

Londonderry Road and N.H. Route 102

Future Year

Figure 39 indicates the lane use and traffic at the intersection in the future year. With the new interchange at Ash Street it will be necessary to construct two through lanes for both N.H. 102 approaches and install signals for this intersection to operate at a Level of Service "D".

Crystal Avenue, Folsom Road, Tsienneto Road

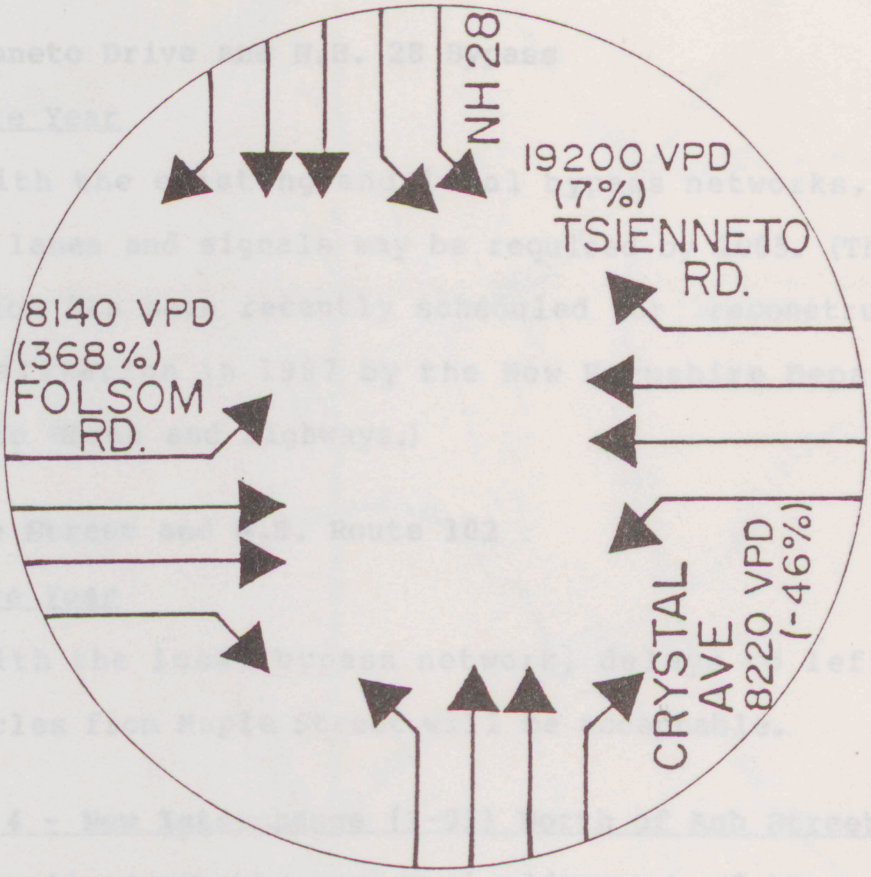
Future Year

Figure 40 shows the lane use and traffic at the intersection in the year 2005. No impacts greater than those discussed previously for the local bypass network will occur at this intersection. Therefore, the improvements previously discussed for the local bypass should be implemented for the interchange network.

N.H. 102, Fordway and High Street

Future Year

As with both the existing and local bypass networks, unacceptable delays may be experienced by vehicles turning left from Fordway. However, signal warrants will not likely be met due to low side street volumes. Prohibiting left turns



FUTURE
WITH ALTERNATE 3 - NEW INTERCHANGE
LANE USE & TRAFFIC ASSIGNMENT

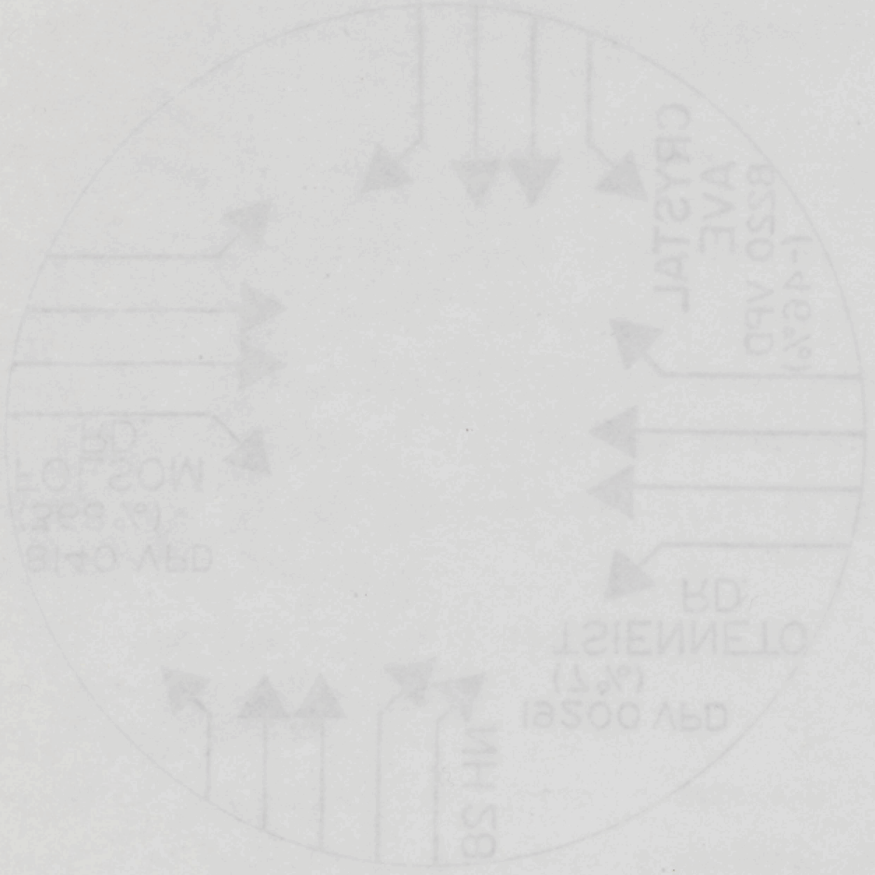
NH 28 and TSIENNETO RD. - FUTURE YEAR

LEGEND

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985



or implementing a one-way street system will most likely be required.

Tsienneto Drive and N.H. 28 Bypass

Future Year

As with the existing and local bypass networks, separate turn lanes and signals may be required by 2005. (This intersection has been recently scheduled for reconstruction and signalization in 1987 by the New Hampshire Department of Public Works and Highways.)

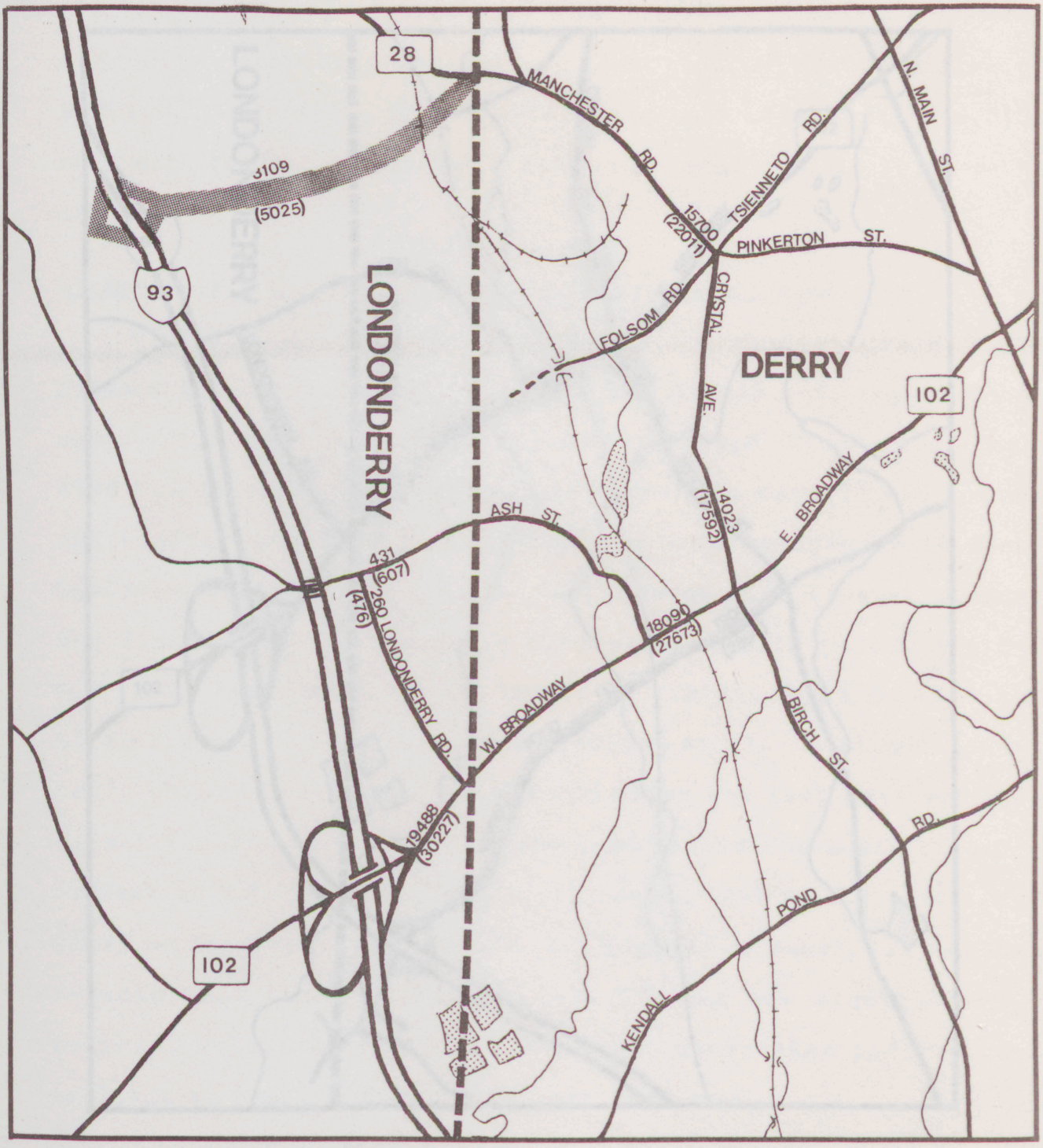
Maple Street and N.H. Route 102

Future Year

As with the local bypass network, delays to left-turning vehicles from Maple Street will be acceptable.

Alternate 4 - New Interchange (I-93) North of Ash Street

Figure 41 shows the proposed alignment of the new interchange north of Ash Street with a connecting road between I-93 and N.H. 28. This alternate bypass consists of a new road on a new alignment. With the diamond interchange in place, 3109 vpd (base year) and 5025 vpd (future year) would be attracted to this northern bypass. This was approximately 50% as much in the base year and 65% as much in the future year when compared with the traffic utilizing the bypasses for alternates 2 or 3. With the new interchange and connecting road in place, the traffic on N.H. 102 would be reduced by approximately 20% and on Crystal Avenue by 13%. Traffic on N.H. 28 north of Folsom Road in the area of "A" Street would be reduced by approximately 7%. Although



ALTERNATE NETWORK 4 - NEW INTERCHANGE (I-93) NORTH OF ASH ST.

LEGEND

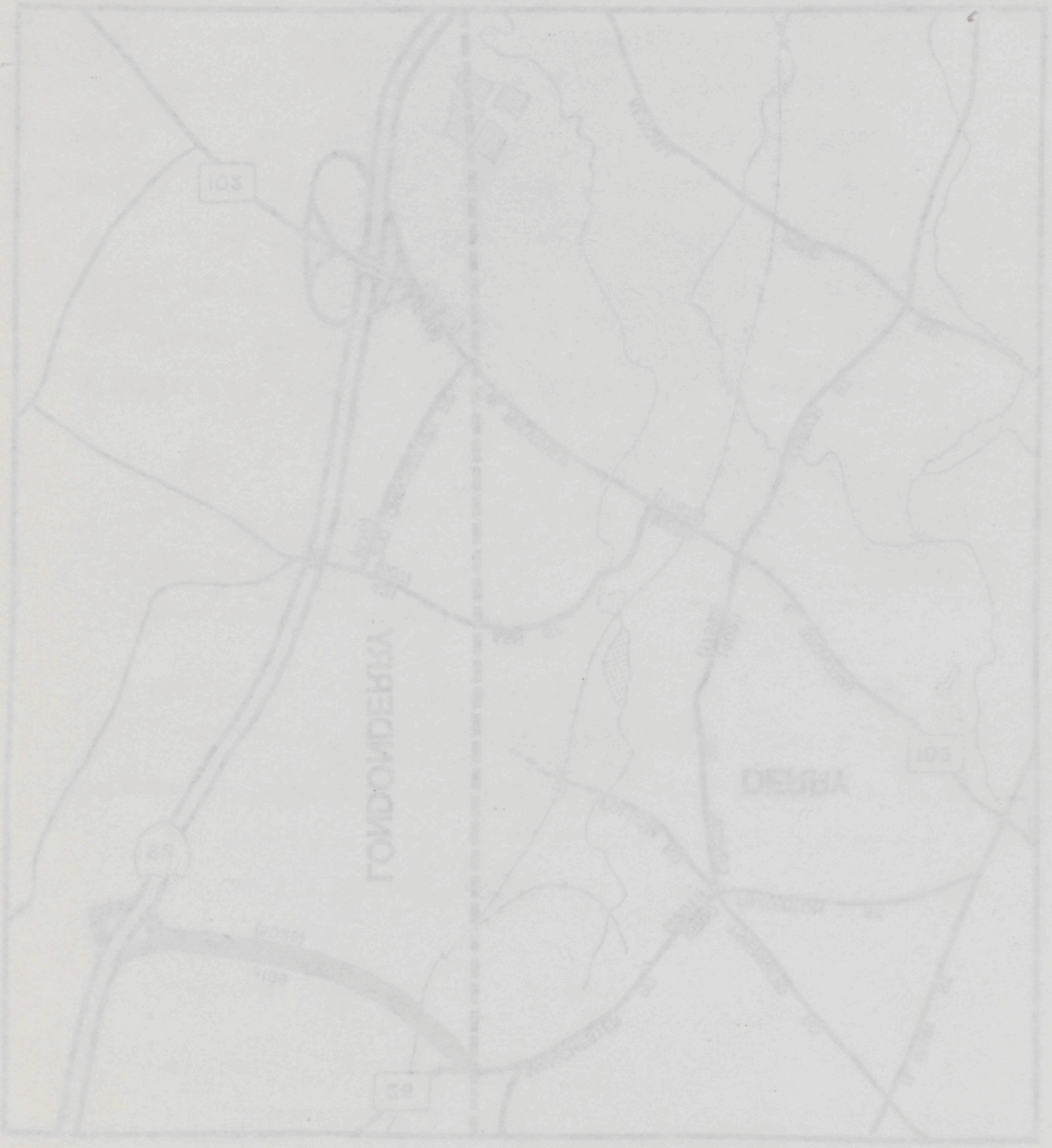
X X X: BASE YEAR

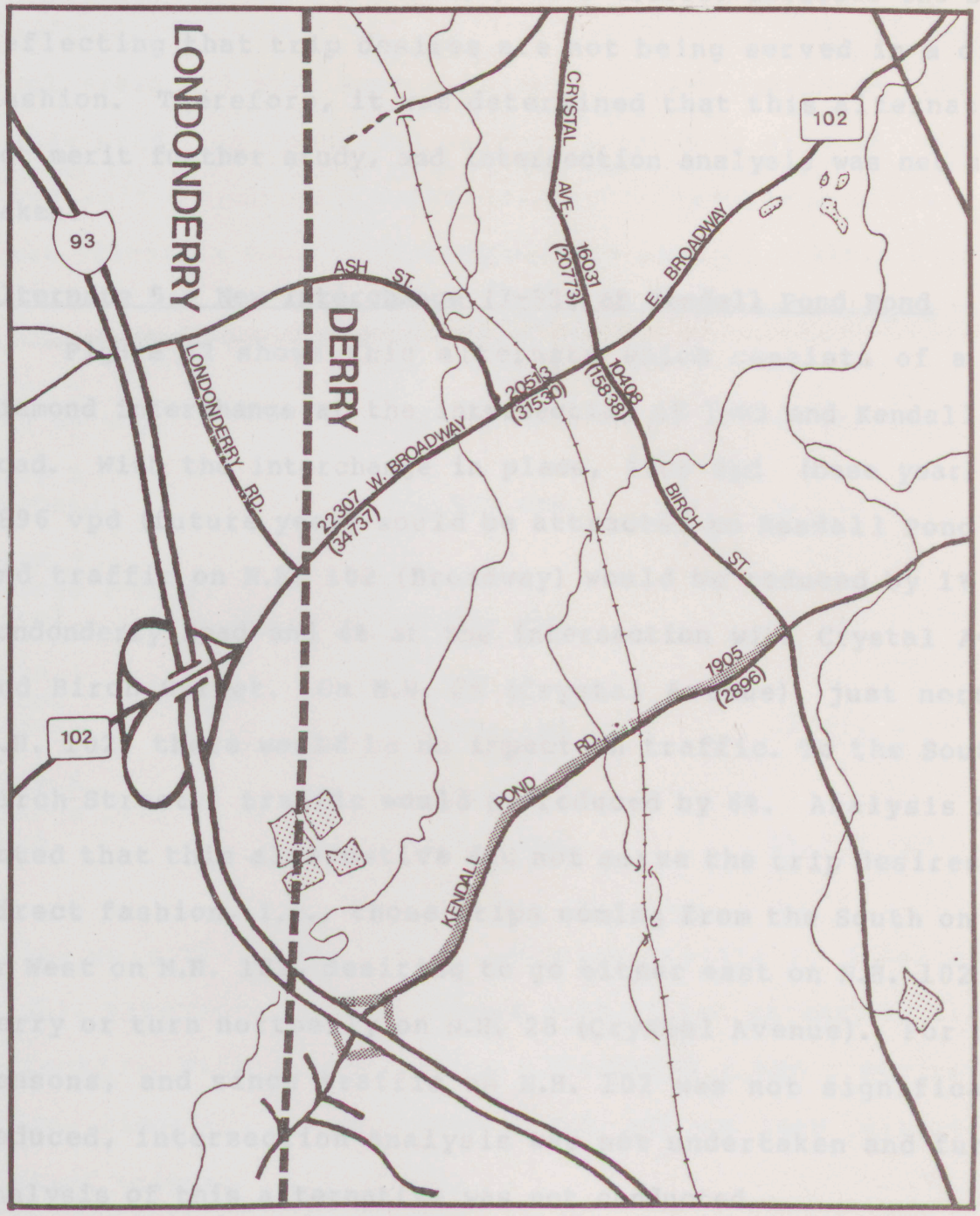
(X XX): FUTURE YEAR

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985





ALTERNATE NETWORK 5 - NEW INTERCHANGE (I-93) AT KENDALL POND ROAD

LEGEND

XXX: BASE YEAR

(XXX): FUTURE YEAR

Prepared by the
Southern New Hampshire Planning Commission

A TRANSPORTATION PLAN for DERRY N.H.

1985

traffic on N.H. 102 is reduced, less traffic utilizes the bypass reflecting that trip desires are not being served in a direct fashion. Therefore, it was determined that this alternate did not merit further study, and intersection analysis was not undertaken.

Alternate 5 - New Interchange (I-93) at Kendall Pond Road

Figure 42 shows this alternate which consists of a full diamond interchange at the intersection of I-93 and Kendall Pond Road. With the interchange in place, 1905 vpd (base year) and 2896 vpd (future year) would be attracted to Kendall Pond Road and traffic on N.H. 102 (Broadway) would be reduced by 1% near Londonderry Road and 4% at the intersection with Crystal Avenue and Birch Street. On N.H. 28 (Crystal Avenue), just north of N.H. 102, there would be no impact on traffic. To the South on Birch Street, traffic would be reduced by 6%. Analysis indicated that this alternative did not serve the trip desires in a direct fashion, i.e., those trips coming from the South on I-93 or West on N.H. 102, desiring to go either east on N.H. 102 thru Derry or turn northerly on N.H. 28 (Crystal Avenue). For these reasons, and since traffic on N.H. 102 was not significantly reduced, intersection analysis was not undertaken and further analysis of this alternative was not conducted.

SUMMARY OF IMPACTS

Comparative Traffic Assignments

The following table illustrates the effectiveness of all alternates investigated in terms of their alleviating the traffic

congestion in Derry's Business District. The traffic assignments on N.H. 102 (Broadway) West of Crystal Avenue were the basis for comparison, as this is a major problem intersection. Base year (1983) traffic assignments for Alternates 2 through 5 show the anticipated traffic volumes at this location if the alternate was constructed in 1983:

Table 15

Comparison of Traffic Assignments

Alternates 1, 2, 3, 4 and 5 on N.H. 102 West of Crystal Avenue

Base and Future Year

	Base Year	Future Year
Alternate 1 Existing Network	21,203 vpd	32,699 vpd
Alternate 2 Local Bypass	16,595 vpd	25,545 vpd
Alternate 3 Interchange I-93 at Ash Street	15,449 vpd	23,813 vpd
Alternate 4 Interchang 3 North of Ash Street	18,090 vpd	27,673 vpd
Alternate 5 Interchange I-93 @ Kendall Pond Road	20,513 vpd	31,530 vpd

Using only the criterion of reducing traffic on Broadway (N.H. 102), Alternate 3 (Interchange I-93 at Ash Street) is the most effective. Futher analysis of alternates 4 and 5 was not undertaken, since traffic reduction on N.H. 102 was less relative to the other proposed alternates.

Anticipated Impacts

The anticipated impacts under Alternates 1, 2 and 3 at the key intersections of N.H. 102 & N.H. 28 (Broadway and Crystal Avenue); Broadway and Londonderry Road; and Crystal Avenue and Tsienneto Road are summarized in the following table:

TABLE 16

ANTICIPATED IMPACTS
LANE USE & TRAFFIC ASSIGNMENTS[1]
FUTURE YEAR (2005)

	Broadway (NH102)- Crystal Ave (NH28)		Broadway (NH102) - Londonderry Road		Crystal Ave (NH28) - Tsienneto Rd - Folsom Road	
	Traffic Assignments	Required Improvements	Traffic Assignments	Required Improvements	Traffic Assignments	Required Improvements
Alternate #1 EXISTING NETWORK	NH 102: 32,700 vpd NH 28: 20,780 vpd	NH 102: 2 thru lanes exclusive turn lanes NH 28: exclusive turn lanes	NH 102: 35,370 vpd Londonderry Rd: 3,100 vpd	NH 102: 2 thru lanes exclusive left turn lanes Londonderry Rd: exclusive right turn lane signals	NH 28N: 20,330 vpd NH 28S: 15,220 vpd Tsienneto Rd: 17,900 vpd Folsom Road 1,740 vpd	NH 28: 2 thru lanes exclusive turn lanes Tsienneto-Folso exclusive turn lanes
Alternate #2 LOCAL BYPASS	NH 102: 25,550 vpd (-22%) NH 28: 13,770 vpd (-33%)	NH 102: 1 thru lane exclusive turn lanes NH 28 (SB): exclusive turn lanes NH 28 (NB): exclusive left turn lane	NH 102: 28,550 vpd (-19%) Londonderry Rd: 7,340 vpd (+137%)	NH 102: 2 thru lanes 2 left turn lanes Londonderry Rd: exclusive right turn lane signals	NH 28N: 18,420 vpd (-10%) NH 28S: 8,220 vpd (-46%) Tsienneto Rd: 18,050 vpd Folsom Road 6,990 vpd (+300%)	NH 28 2 thru lanes exclusive turn lanes Tsienneto-Folsom 2 thru lanes exclusive turn lanes
Alternate #3 INTERCHANGE (I-93) at ASH STREET	NH 102: 23,810 vpd (-27%)	NH 102: 1 thru lane exclusive turn lanes	NH102E: 23,600 vpd (-33%)	NH 102 2 thru lanes	NH28N: 18,420 vpd (-10%)	NH 28 2 thru lanes exclusive turn lanes

Table 16
Anticipated Impacts (Future Year 2005)
Page 2

	Broadway (NH 102) - Crystal Ave (NH 28)		Broadway Londonderry Road		Crystal Ave (NH28)-Tsienneto Rd Folsom Road	
	Traffic Assignments	Required Improvements	Traffic Assignments	Required Improvements	Traffic Assignments	Required Improvements
Alternate #3 INTERCHANGE (I-93) at ASH STREET (continued)	NH 28: 13,200 vpd (-36%)	NH 28 (SB): exclusive turn lanes NH28 (NB): exclusive left turn lane	NH 102W: 26,440 vpd (-25%) Londonderry Rd: 2,840 vpd (-8%)	Londonderry Rd 1 lane OK exclusive right turn lane signals	NH 28S: 8,220 vpd (-46%) Tsienneto Rd: 19,200 vpd (+7%) Folsom Rd: 8,140 vpd (+368%)	Tsienneto-Folsom 2 thru lanes exclusive turn lanes

[1]Traffic Assignments for Alternate #1, Existing Network, reflect increases in traffic for the future year; the traffic reductio percentages shown for Alternates #2 and #3 are reductions relative to those shown for Alternate #1. There are absolute future year traffic increases regardless of the Alternate being reviewed.

Alternate Capital Costs

The following table indicates the capital costs associated with each of the proposed alternates, including associated projects:

Table 17

Alternate Long Range Capital Improvements[1]

Project	Alternate 1 Improve Existing Network	Alternate 2 Local Bypass	Alternate 3 Interchange I-93 at Ash St.
A. Broadway	$2,500,000	$1,350,000	$1,350,000
B. N.H. 28/N.H.102 Intersection	945,000	1,050,000	1,050,000
C. London [illegible]y Road includ[illegible] N.H. 102 Intersection	150,000	1,887,000	1,000,000
D. Crystal Ave./Tsienneto Road/ Folsom Rd. Intersect.	850,000	875,000	875,000
E. Maple Street	1,000	1,000	1,000
F. By-Pass	NA	3,500,000	3,500,000
G. Ash Street Interchange	NA	NA	5,000,000
Total	$4,446,000	$8,663,000	$12,776,000

[1]Costs are given in 1985 dollars, and exclude any right-of-way acquisition.

Required improvements are those as cited in Table 16 for Projects B, C, and D. Improvements to Broadway (Project A) range from the provision of four lanes between I-93 and N.H. 28 under

Alternate 1, to the provision of four lanes for something less than this distance under Alternate 2 and 3. Project E, Maple Street, represents the implementation of restrictions on left hand turning movements. Project F, Bypass, represents improvements to Ash Street and new construction on a new alignment between Ash Street (@ the Londonderry/Derry Town Line) and Folsom Road for Alternates 2 and 3. Required improvements to Londonderry Road as part of the Local Bypass are included in Project C, Alternate 2 total costs. Project G, Ash Street Interchange, represents a full diamond interchange with I-93.

CONCLUSION

The summary of impacts has clearly shown that either Alternates 2 or 3 would postpone some of the improvements necessary to the existing network in the future year at the problem intersection of N.H. 28 and N.H. 102. In terms of reducing the future traffic on Broadway, N.H. 102, Alternate 3, Interchange (I-93) at Ash Street, relieves the most traffic at the key intersections of N.H. 102/N.H. 28; Londonderry Road/N.H. 102 and Crystal Avenue/ Tsienneto Road/Folsom Road (refer to Table 16).

In terms of cost, Alternate 1, Existing Network, requires the least amount of capital outlay, i.e., $4,446,000 (refer to Table 17). As noted during the discussion of Alternative Highway Networks (refer to Chapter VI), this alternate would require the removal of some on-street parking in the downtown area, necessitated by the upgrading of the facility, i.e., providing four travel lanes (48') and two sidewalks (14'). The facts that

- removing some of the parking in the central business district would be unpopular;
- Broadway (N.H. 102) traffic is not relieved in the future year;
- estimated project cost is still $4,446,000;

make Alternate 1, Improve Existing Network, a not-too-desirable solution.

Alternates 2 and 3, evaluated on the basis of traffic reduction and capital costs, indicate the following:

- "buy" time at some of the problem intersections;
- reduce traffic on Broadway (N.H. 102);
- require right-of-way acquisition, not addressed in this document;
- require further investigation in regard to environmental impacts;
- require very similar intersection improvements (refer to Table 16);
- require the removal of less parking in the central business district.

Alternate 3, Interchange (I-93) at Ash Street, would additionally reduce traffic on Broadway (N.H. 102) by 4% to 14% as the direct result of constructing a $5,000,000 diamond interchange at Ash Street which diverts traffic north of Broadway. Traffic reductions occur at the key intersections of N.H. 102/N.H. 28 and N.H. 102/Londonderry Road (see Table 16, comparing Alternates 2 and 3). The total estimated cost for implementing Alternate 3 is $12,776,000, when compared to the $8,663,000 required for Alternate 2, Local Bypass. The added

reductions in traffic on Broadway (N.H. 102) do not seem to justify the additional $5,000,000 expenditure for the interchange, when considering that both Alternates 2 and 3 require very similar intersection improvements.

On the basis of capital cost and traffic reduction to desirable levels on Broadway (N.H. 102), it is recommended that Alternate 2, Local Bypass, and all inclusive projects be implemented as part of the long range capital improvement program.

As indicated previously, this alternate requires further study in terms of its environmental impacts, right-of-way acquisition and design implementation.

Chapter VII. RECOMMENDED IMPROVEMENT PROGRAM

INTRODUCTION

The recommended program of projects includes improvements of a short and long range nature. The recommended short range projects should be implemented irrespective of when the long range projects are implemented. Most of the long range capital improvements are associated with that alternate that reduced traffic on N.H. 102 and was cost effective in so doing. Others were identified through field observation and accident statistics.

Table 18 indicates cost of improvements; no right- of- way acquisition costs are reflected in any of the totals. The recommended Alternate 2 requires further study in terms of its environmental impacts.

SHORT-RANGE CAPITAL IMPROVEMENTS

A. N.H 28 and N.H. 102 - Provide an additional signal phase to accommodate N.H. 28 traffic, thereby improving the level of service from "E" to "D", and construct an exclusive left turn lane on Birch Street to reduce existing queue lengths.

B. Tsienneto Road and By-pass 28 - Reconstruction and installation of traffic signals.

C. Maple Street and Broadway (N.H. 102) - Channelize Maple Street to discourage "U"-turns.

Table 18

Recommended Improvement Program[1]

	Project	Cost
Short Range		
A.	N.H. 28/N.H. 102 Intersection	$ 50,000
B.	Tsienneto Road/N.H. 28 ByPass Intersection	200,000
C.	Maple Street/Broadway Intersection	10,000
D.	Kendall Pond Road/Fordway Intersection	10,000
E.	N.H. 28/Windham Road Intersection	35,000
F.	Fordway/N.H. 102 Intersection	1,000
	SUBTOTAL	$306,000
Long Range		
A.	Broadway	$1,350,000
B.	N.H. 28/N.H. 102 Intersection	1,050,000
C.	Londonderry Road including N.H. 102 Intersection	1,887,000
D.	Crystal Ave/Tsienneto Rd/Folsom Rd Intersection	875,000
E.	Maple Street	1,000
F.	Bypass	3,500,000
G.	N.H. 28/Windham Road Intersection	135,000
H.	N.H. 102/N.H. 28 Bypass Intersection	1,400,000
I.	N.H. 28/N.H. 28 Bypass Intersection	400,000
	SUBTOTAL	$10,598,000
	TOTAL	$10,904,000

[1]Costs are given in 1985 dollars, and exclude any right-of-way acquistion.

D. Kendall Pond Road & Fordway Extension - Eliminate sight distance restrictions; reduce curve radii; and stripe all intersection approaches.

E. N.H. 28 and Windham Road - Channelize intersection to reduce present extreme width that is causing driver disorientation.

F. Fordway & N.H. 102 - Prohibit left turns from Fordway westbound onto N.H. 102. Traffic signals are not warranted at this intersection due to low side street volumes.

LONG-RANGE CAPITAL IMPROVEMENTS

A. Broadway - Provide two thru lanes in each direction, but not necessarily all the way to I-93.

B. N.H. 28 and N.H. 102 - Provide one thru lane on N.H. 102 with exclusive turn lanes and one thru lane on N.H. 28 with exclusive turn lanes.

C. Londonderry Road and N.H. 102 - Provide for two thru lanes on N.H. 102 with two left turn lanes; provide exclusive right turn lane and left turn lane on Londonderry Road; install traffic signals.

D. Crystal Avenue and Tsienneto Road/Folsom Road - Provide two thru lanes with exclusive turn lanes on both approaches on N.H. 28; provide two thru lanes and exclusive turn lanes on the Tsienneto and Folsom Road approaches.

E. Maple Street & N.H. 102 - Prohibit left turns from Maple Street onto N.H. 102 causing intersection failure or convert to one way pair.

F. Bypass - Construct local Bypass, consisting of Londonderry Road, Ash Street and a new road constructed on a new alignment between Ash Street (@ the Londonderry/Derry townline) and Folsom Road; upgrade of Tsienneto and Folsom Roads.

G. N.H 28 & Windham Road - Relocate Kendall Pond Road to intersect Windham Road south of N.H. 28.

H. N.H. 102 & N.H. 28 Bypass - Undertake major reconstruction to provide a 4-way signalized intersection, requiring the relocation of East Derry Road.

I. N.H. 28 and N.H. 28 Bypass - Realign N.H. 28 Bypass for lane uniformity and regrade N.H. 28 for increased sight distance.

GLOSSARY

Attractions - The attracting power of a zone. Attractions in a zone can be considered synonymous with trip destinations in that zone.

Auto Occupancy Rate - The average number of persons per vehicle used to convert person trips to vehicle trips.

Average Daily Traffic - The average number of vehicles passing a specific point during a 24-hour period.

CAF- Consolidated Accident File.

Capacity - The maximum number of vehicles which has a reasonable expectation of passing over a given section of a roadway during a one-hour period under prevailing roadway and traffic conditions.

CBD (Central Business District) - The portion of Derry in which the dominant land use is business activity.

Cordon Survey - A survey that obtains data on the number of externally generated trips, i.e., entering Derry made by persons outside of Derry.

Design Hour Volume (DHV) - A volume determined for use in design representing traffic expected to use a road during a specific hour.

Desire Line - a straight line connecting the origin and the destination of a trip. A desire line map is made up of many such desire lines, the width or density of which represents the volume of trips moving between the origin and destination.

Destination - The terminal end of a trip or the zone in which a trip terminates.

External-External Trip - A trip with both the origin and destination ends outside Derry.

External-Internal Trip - A trip with one end outside and the other inside Derry (also called Internal-External Trip).

Forecasting - The process of determining the future values for dwelling units, population, employment and auto ownership, which affect trip making in Derry.

Friction Factor - An empirically determined set of factors, each factor expressing the effect of one particular travel time increment on trip interchanges between zones.

Gravity Model - A mathematical model of trip distribution based on the premise that trips produced in any given area will distribute themselves in accordance with the accessibility and the opportunities other areas offer.

Home Based Trip - A trip with either the origin or destination at the household.

Internal-Internal Trip - A trip with both the origin and destination ends in Derry.

Level of Service - A qualitative measure of differing operating conditions that may occur on a given lane or roadway when it is accommodating various traffic volumes, ranging from "A" (free flow) to "F" (forced flow). Affected factors include speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience, and operating costs.

Minimum Path - That route of travel between two points which requires the least accumulation of time or distance to traverse.

MMPS Area - The Metropolitan Manchester Planning Study Area, including the City of Manchester and the towns of Auburn, Bedford, Goffstown, Hooksett and Londonderry.

NHDPW&H - The New Hampshire Department of Public Works and Highways.

Network - The system of links describing the Derry transportation system being analyzed; traffic assignments are made on this network.

Non-Home Based Trip - A trip with neither the origin nor destination end at the household.

Origin - The beginning end of a trip or the zone in which a trip begins.

Socioeconomic - Involving the combination of social and economic factors.

SNHPC - The Southern New Hampshire Planning Commission.

Terminal Time - That time required to park, unpark and walk to complete a trip, exclusive of actual travel time.

Total Travel Time - The sum of travel time and terminal time.

Traffic Assignment - The process of loading zone-to-zone trips via the minimum time paths on the network.

Traffic Model - A mathematical equation and graphical technique that simulates travel patterns in urban areas.

Traffic Zone - A subdivision of the study area which is used for analysis and data collection.

Travel Time - The time required to travel between two points, excluding terminal time.

Travel Time Matrix - A matrix that reflects the total travel time required between traffic zone contracts (center of activity).

Trip Distribution - The process by which the movement of trips between zones is estimated from trip ends. For each particular zone, originating trips are proportionately distributed to destinations in all other traffic zones.

Trip End - One of two ends, either the origin or the destination, for any given trip.

Trip Generation - A general term describing the relationships which exist between the tripmakers, the urban area, and the tripmaking. It relates to the number of trip ends in any part of the urban area.

Trip Table - All vehicle trips having one or both trip ends in Derry (i.e., internal to internal and internal to external) plus through trips (external to external).

Trip Purpose - The reason for making the trip. Normally each trip has a purpose at each end, e.g., home to work.

Vehicles Per Day - The number of vehicles passing a specific point during a 24-hour period.

Vehicle Trip - The use of one vehicle between an origin and destination.

Southern New Hampshire Planning Commission
815 Elm Street/Manchester, N.H. 03101
603·669·4664

TO: The Chairman, Board of Selectmen for the towns of Derry, Londonderry and Chester

FROM: M. Sharma, Executive Director

RE: A Transportation Plan for the town of Derry

DATE: May 31, 1985

Enclosed please find a draft copy of the Transportation Plan for the town of Derry.

As you may recall, the staff of the Commission, its Consultant, and the Officials of the State Highway Dept. have been working on this study for the past eight to ten months. We have now reached a point which requires your inputs before the Plan is printed in the final form.

Please note, given the funding and time constraints, this plan does not analyze the impacts of the recommended actions on the surrounding towns. These can and should be accomplished during the environmental phase of the project.

Please review this carefully and offer your comments by no later than June 30, 1985.

We intend to print this document sometimes during the months of July/August, 1985.

cc: NHDPW&H

Town of Derry

RECEIVED JUL 1 1985

DERRY, NEW HAMPSHIRE

June 28, 1985

Mr. Monie Sharma
Southern N.H. Planning Commission
815 Elm Street
Manchester, NH 03101

Dear Monie:

The Board of Selectmen wish to thank you for the Transportation Plan for the Town of Derry that you submitted. We sincerely appreciate the time and effort you extended in preparing this report.

We have chosen Alternate 3 as our best solution to resolving the traffic congestion we are facing.

Our meeting held on June 26 was a success and the united community spirit and support was overwhelming.

Sincerely,

Edward Anderson, Chairman

Janet Conroy

May Castan

H. Robert Kling

Richard Buckley

Selectmen

Town of Derry